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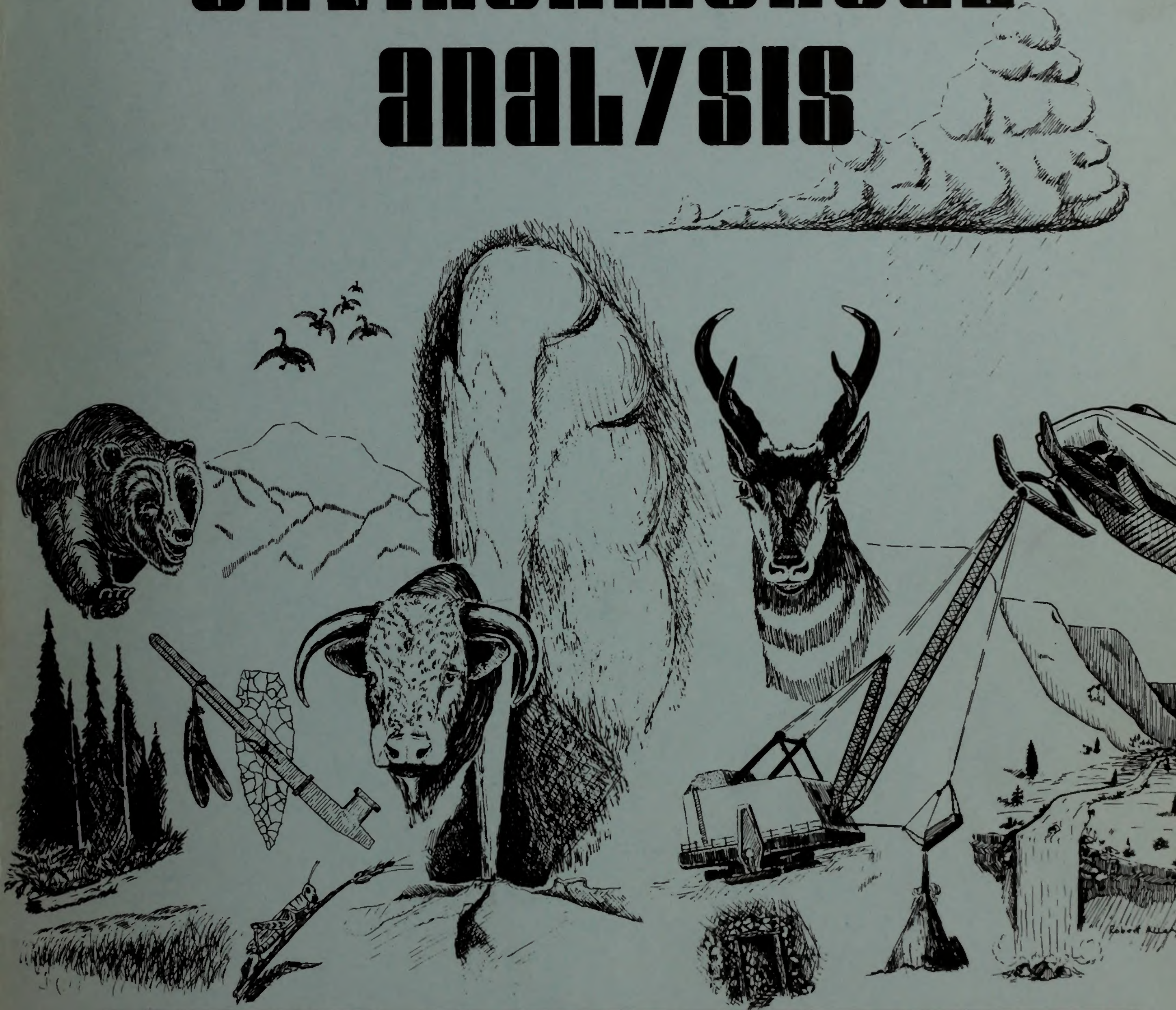

final environmental analysis record

VELVA MINE COAL LEASE

miles city district montana

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1791 - ENVIRONMENTAL ANALYSIS

FINAL

CONSOL-VELVA COAL LEASE APPLICATION M-31969(ND)

ENVIRONMENTAL ANALYSIS RECORD

September 1976

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Miles City District
U.S. Department of the Interior - Bureau of Land Management

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INTRODUCTION

Consolidation Coal Company is proposing to lease for mining 120 acres of federal coal adjacent to what is referred to as their Velva Mine, near Velva, North Dakota. This analysis examines and records the possible impacts that may result if the Bureau of Land Management (BLM) leases the coal. Physical and biological impact analyses are, for the most part, limited to the mine area, but air, water, and socio-economic factors are analyzed on a broader scale.

A specific analysis on the 120 acres is necessary in order to comply with the National Environmental Protection Act of 1969, and to assist the decision maker in weighing the environmental consequences of a decision on the proposed lease.

SUMMARY

Consolidation Coal Company's Velva mine has been in continuous operation for well over 40 years. Consolidation Coal Company proposes to lease 120 acres of federal coal, part of which has already been mined, to add to their present coal reserves.

This Environmental Analysis Record (EAR) indicates that mining the additional coal would provide only limited additional environmental impacts beyond those that have already occurred due to the past and present mining activities. The proposed lease would facilitate a more efficient and practical mining and reclamation plan and would prevent the loss of federal coal adjacent to the present mined area. This is referred to as a loss of coal because present and foreseeable mining economics may not permit a later return to mine the remaining coal after the adjacent area has been mined and reclaimed.

CHAPTER 1

DESCRIPTION OF THE PROPOSED ACTION

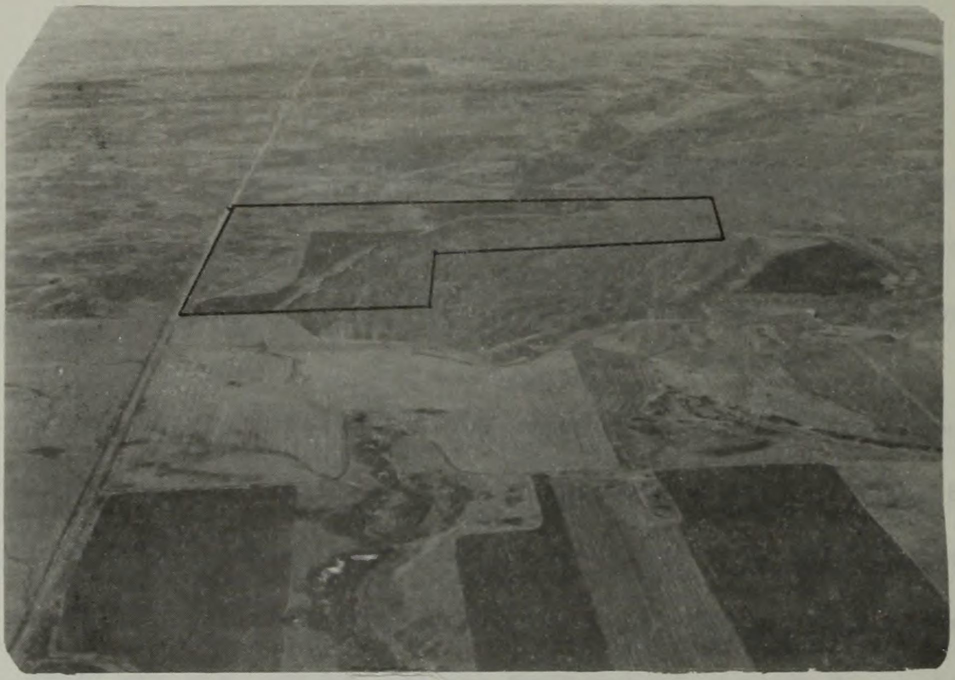
APPLICANT'S PROPOSAL

The proposal to be analyzed by this Environmental Analysis Record is the proposed lease of approximately 120 acres of federal coal to Consolidation Coal Company. The coal under consideration is adjacent to Consolidation Coal Company's Velva Mine in Ward County, North Dakota. The legal descriptions of the tracts involved are the NW¼SE¼, and the S½SE¼, Sec. 1, T. 151 N., R. 81 W., 5 P.M.

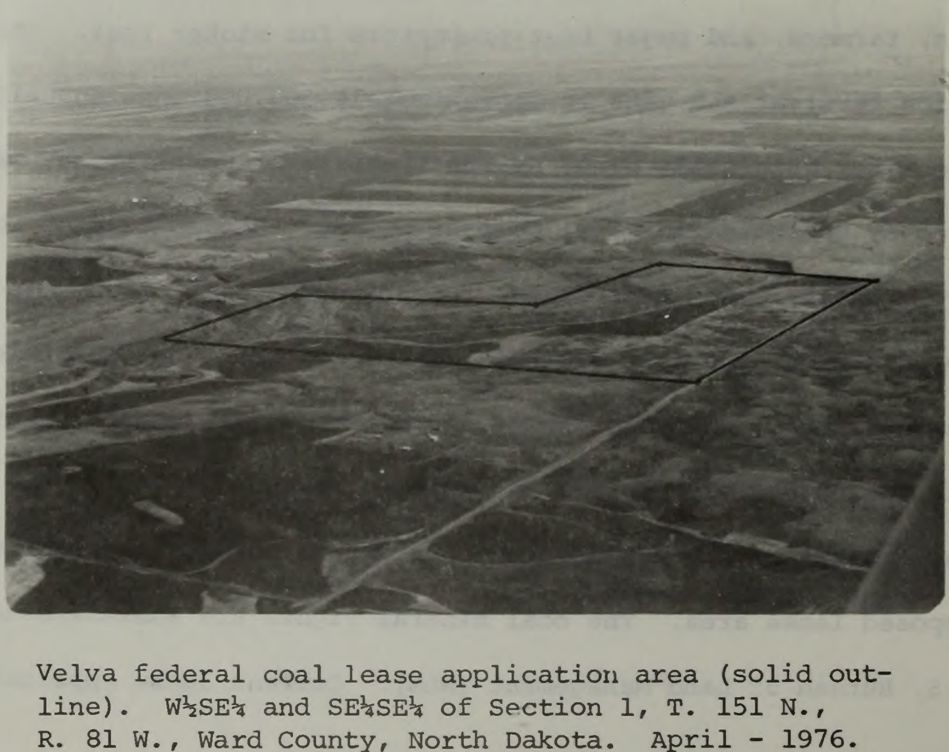
Mining at Velva has been a continuous operation since 1929. The coal provides fuel for Basin Electric Power Cooperative's Neal power plant at Voltaire, North Dakota. A limited amount is also used by local ranchers, farmers, and sugar beet processors for stoker fuel. The production level at the mine is approximately 500,000 tons annually.

The mine, originally owned by the Truax-Traer Corporation, was purchased by Consolidation Coal Company in 1962. Consolidation Coal Company, a wholly owned subsidiary of Continental Oil Company, is incorporated under the laws of the State of Delaware, headquartered in Pittsburgh, Penn., and authorized to hold coal leases issued under the Mineral Leasing Act of February 25, 1920, as amended.

The federal government does not own any of the surface rights in the proposed lease area. The coal mineral rights are administered by the U. S. Bureau of Land Management (BLM). Current lease applications



Velva federal coal lease application (solid outline). W½SE¼ and SE¼SE¼ of Section 1, T. 151 N., R. 81 W., Ward County, North Dakota. April - 1976. Aerial view looking west.



Velva federal coal lease application area (solid outline). W½SE¼ and SE¼SE¼ of Section 1, T. 151 N., R. 81 W., Ward County, North Dakota. April - 1976. Aerial view looking northeast.

PHOTO 1-1

must meet the Secretary of the Interior's short-term criteria for coal leasing in order for the BLM to lease federal coal. The BLM determined in February, 1976, from information furnished by Consolidation Coal Company, that the criteria had been met. This determination was based on:

1. The 120 acre tract of federal coal is located at the southern edge of Consolidation Coal Company's Velva mine, and the mine is currently active.
2. Consolidation Coal Company has a commitment for an annual production of 480,000 tons of coal from the Velva operation.
3. The federal coal in this application is needed to sustain the operation. If the federal coal is obtained, production would begin in 1977.
4. The federal coal is located in the path of a logical mining sequence. Changing the path to avoid the federal coal could result in the non-utilization of an estimated 1.6 million tons of federal coal.
5. It may not be economically possible to mine this coal at a later date if bypassed. Also, once reclaimed it would be undesirable to return and disturb reclaimed land to mine the relatively small acreage of federal coal.
6. The applicant currently holds three coal leases. Two of these leases are located 50 to 60 miles away at the Glenharold Mine. Coal from these two leases cannot economically supply the needs of the Velva area. The third lease is located at Velva, but has been mined out.

Based on the preceding, it was judged that the lease application met the Secretary's criteria one and two. That is, the coal is needed to maintain an existing mining operation, and as a reserve in the near future.

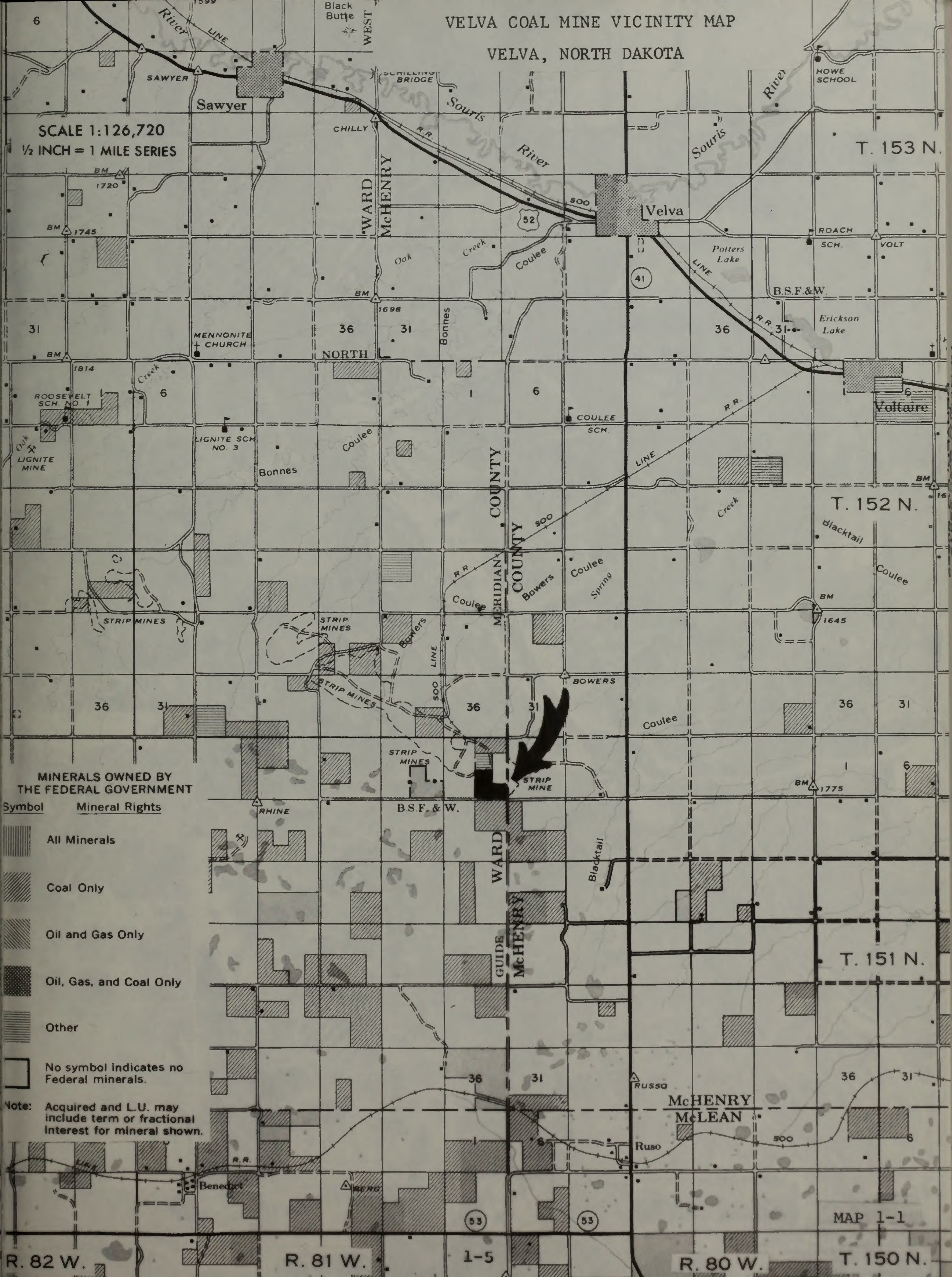
The ultimate purpose of the lease is to provide electrical energy to a portion of the Mid-West. The major portion of the production from the Velva mine goes to Basin Electric Cooperative's Neal power plant at Voltaire, North Dakota. This is a small facility with two 22 MW generating plants. The power from this plant is distributed to rural consumers through a network of twelve generating plants and 101 district cooperatives. The network provides electrical energy to North Dakota, South Dakota, Minnesota, Montana, Wyoming, Nebraska, Iowa, and parts of Colorado and Kansas. In addition, agreements with the U. S. Bureau of Reclamation and Mid-Continent Area Power Pool (MAPP) permit distribution to other areas during periods of high energy use. The local sugar beet industry relies heavily on coal power from this mine.

The Velva mine is located about eight miles south of the community of Velva, North Dakota (see location map). Velva is a small community located on U.S. Highway 52, about 20 miles southeast of Minot.

Currently, the mine's programmed life is 10 to 15 years. At the current rate of production, approximately 16-20 acres per year is disturbed by mining. Current technology and economics dictate that the area be developed by strip mining techniques. The operation at Velva is now at a point where the federal coal in the proposed lease must be either leased and mined, or bypassed. The coal would be mined if leased in the near future. The likelihood of it ever being mined is remote, if it is bypassed.

VELVA COAL MINE VICINITY MAP

VELVA, NORTH DAKOTA



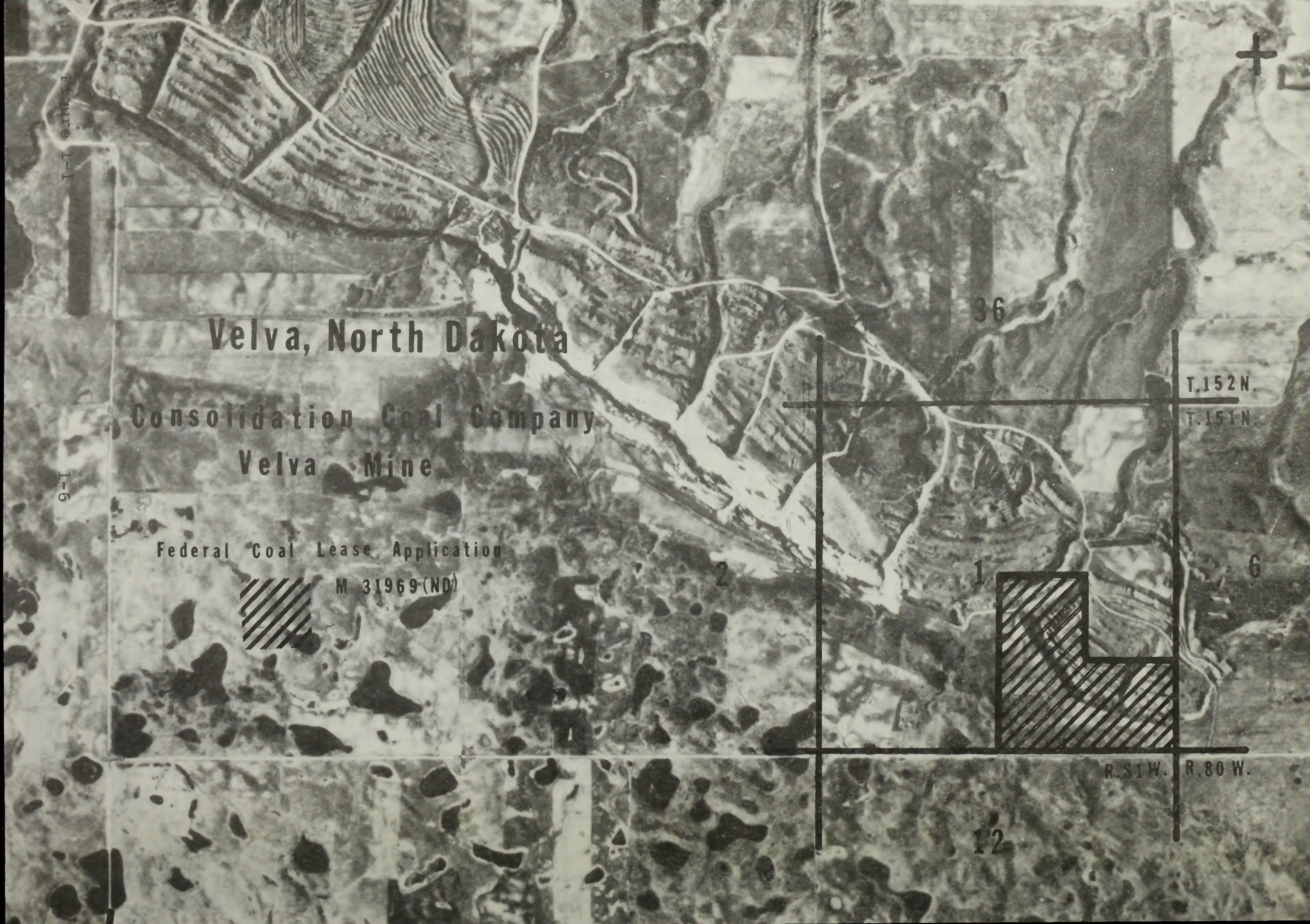

Velva, North Dakota
Consolidation Coal Company
Velva Mine
Federal Coal Lease Application
M 31969(ND)
36
T.152N.
T.151N.
1
2
6
12
R.81W.
R.80W.

Figure 1-1

At some time in the past, a portion of the proposed lease area was mined. It is estimated that between 50-55 acres of coal was removed. This minerals trespass is under investigation by the BLM Montana State Office Minerals Staff. Appropriate civil and/or legal action will be undertaken upon conclusion of that investigation. The minerals trespass investigation is being handled as a separate entity from the subject coal lease application and EAR.

That coal which remains on the proposed lease application, approximately 65-70 acres, would be enough to operate the mine for approximately 3½-4 years at the present operating rate (16-20 acres/year). Reclamation should be completed within three years after termination of the mining permit term according to North Dakota State Law. The company must be given two one-year extensions by the state, upon request. Further extensions, on a year-to-year basis, may be made at the discretion of the state. This means that if the coal was leased this year, mining would be completed by late 1980, and reclamation completed by late 1983. It would be more realistic to assume some delay in mining and reclamation, and in fact, the action, including reclamation is not expected to be completed before 1988.

Mining takes place in two stages. Each will be discussed in detail. Because the mine is presently in existence, construction of roads and facilities will not be analyzed. The two stages that will be analyzed are mining and reclamation. These stages contain several discrete operations which, even though described separately, may occur simultaneously.

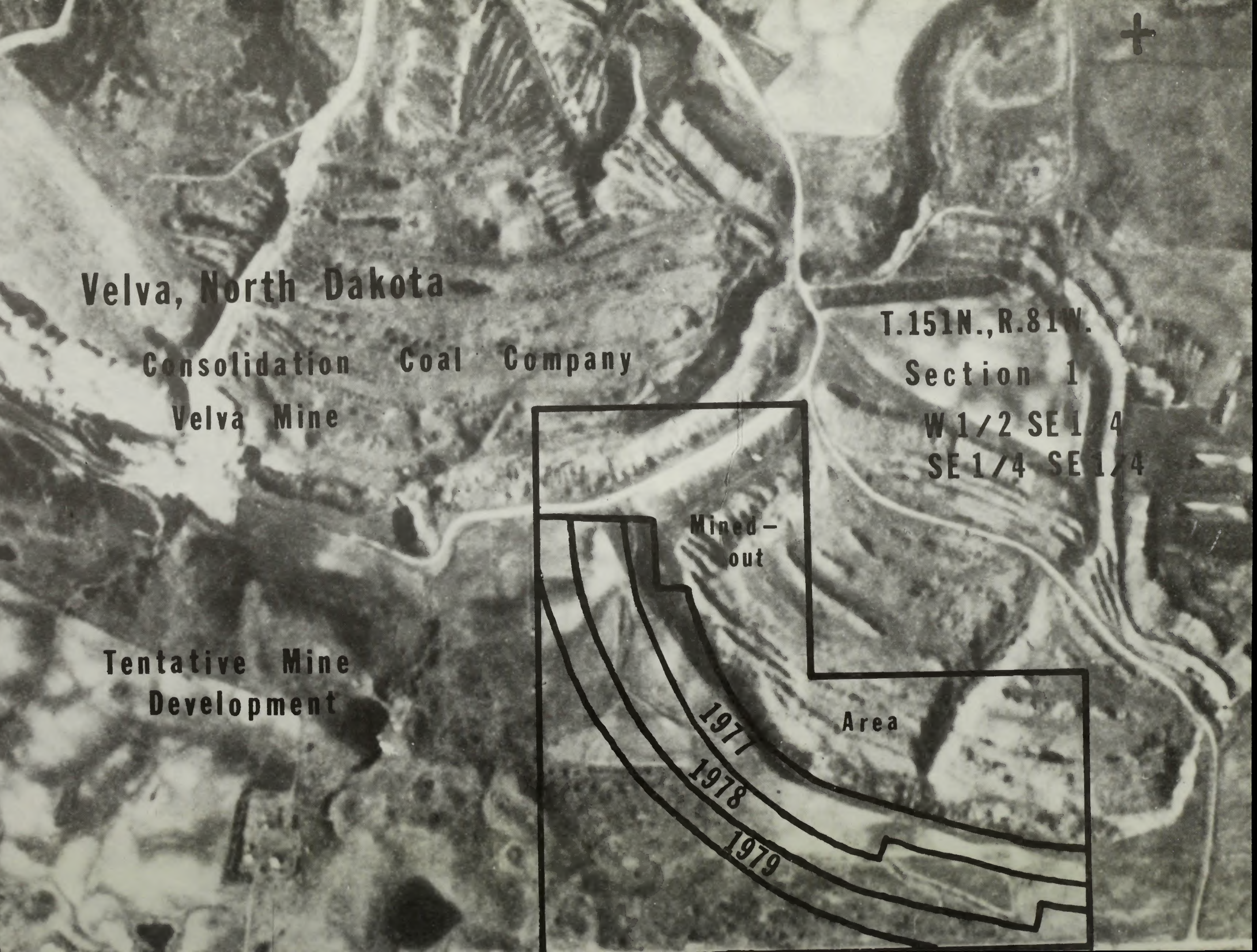

Velva, North Dakota
Consolidation Coal Company
Velva Mine
T.151N., R.81W.
Section 1
W 1/2 SE 1/4
SE 1/4 SE 1/4
Mined-out
Area
1977
1978
1979
Tentative Mine
Development

Figure 1-2

Mining

Removal and Stockpile of Soils

Soils are removed in two steps following classification and mapping by a state registered soils classifer. The first step is removal of topsoil by heavy equipment. The topsoil is either transported and stockpiled for later use in reclamation, or placed on graded spoil piles and subsoil. The second step is the removal of subsoil. The subsoil is transported and stockpiled separately from the topsoil in order to reduce the mixing of topsoil and subsoil when respread during reclamation, or placed directly on graded spoil piles.

Wind and water erosion of the stockpiles may be controlled by proper positioning and seeding. The seeding composition must be approved by the BLM District Manager and the North Dakota Public Service Commission.

Removal of Remaining Overburden

The remaining overburden (all materials between subsoil and coal seam) are removed with an electric powered, 13 yard dragline. The overburden removed from the coal is piled adjacent to the cut. Each succeeding cut's overburden is placed in the immediately preceding trench. This operation occurs 24 hours a day. A grader or front end loader follows the dragline and removes loose clay from the top of the coal seam.

Excavation and Loading

Following removal of the overburden, a 6 yard, electric, coal-loading shovel excavates and loads the coal into 45 ton, diesel powered, coal haulers.

Transportation, Delivery and Crushing

The coal is transported from the pit to coal preparation facilities, over a 7% grade ramp road, and unpaved haul roads. There it is dumped, crushed to less than 1½ inches, and loaded in coal cars for movement by rail to the Neal Power Plant, other customers, or stockpiled for future loading.

Reclamation

Reclamation, some of which is contracted to a private operator, includes three discrete operations:

Regrading

During reclamation, the overburden piles are reshaped to a level or gently rolling form. This includes the final highwall, or last cut, which normally has little overburden put back into it. The highwall is cut back and graded to blend with the adjacent terrain. Large bulldozers and scrapers are normally used in this process. Regrading is usually done two to three spoil piles behind the mining operation, depending on weather and working conditions.

Soil Replacement

Subsoil is spread on the reshaped overburden. Topsoil is spread on top of the subsoil. Soil replacement operations are performed by large wheeled tractor-scrapers during dry seasons of the year.

Seeding

The seeding operation involves site preparation (such as contour plowing) and seeding with appropriate vegetation. This may include the use of a bulldozer, but is normally limited to farm tractors and implements.

If the project proceeds as proposed, all existing federal and state laws and regulations pertaining to coal strip mining and its associated effects on the environment would apply.

There are also a number of standard stipulations (minimum mitigating measures) in the current federal lease form. The following minimum standards are general and relevant to this analysis (additional and more specific mitigating measures will be developed as a result of the findings in this report):

1. Toxic overburden which could jeopardize reclamation shall be buried at a minimum depth of five feet below the surface.
2. Soil material used in reclamation shall be removed, segregated, stockpiled, or placed directly on areas that have been mined and prepared for reclamation. Soil material which will be stockpiled for more than one year shall be seeded. Protective measures, such as orientation of stockpiles and reduced stockpile slopes, shall be taken to prevent soil loss to wind and water erosion.

3. Full use must be made of available technology to prevent or minimize subsurface piping and slumping by support material.
4. All spoils must be graded to the approximate original land topography.
5. Prior to reclamation, the company, the surface owner, the North Dakota Public Service Commission and BLM representatives shall collectively determine areas to be reclaimed to native conditions and/or cultivation.
6. Seeding and planting composition, rates, and other revegetation criteria will also be determined following regrading.
7. Seeding will be repeated as instructed until it has been determined successful by BLM and the North Dakota Public Service Commission.
8. Where an excavation is to be left for permanent water impoundment, access appropriate to its use should be provided at suitable intervals for persons, wildlife and domestic livestock.
9. Disposition of any final highwall shall be determined after consultation with the U. S. Geological Survey, BLM, the North Dakota Public Service Commission, and the mining company.
10. To prevent or abate environmental pollution, any excessive amounts of pollutants will be prevented from reaching the air, water, or land resources, including surface water sources and ground water aquifers (subsurface strata through which ground water moves). "Excessive amounts" of pollutants means any amount which exceeds the maximum amount permitted by the Federal Water Pollution Control Administration, the National Air Pollution Control Administration, and by the appropriate agency of the State of North Dakota.

11. Haul roads shall be constructed to the minimum width necessary for efficient and safe operations. Haul roads must have adequate drainage and be constructed consistent with good watershed practices. Haul roads shall be sprinkled with water at time intervals necessary to reduce air pollution resulting from dust. Haul roads shall be located, in so far as feasible, so as not to interfere with proper shaping of spoilpiles. Haul roads may double as access roads.

12. Dams, ditches, dikes, and canals used for surface water control in and around the mining operation shall be constructed in accordance with approved engineering practices and located so as to do the least amount of environmental damage. Soil material shall be placed on all dams and dikes following construction. These and all areas denuded during construction of water control structures shall be seeded after placement of soil material.

13. All drainage waters discharged into natural drainages must meet state and federal water quality standards. Waters which enter the pit or overburden areas must meet state and federal test requirements, prior to discharge into natural drainages. If necessary, they shall be impounded for chemical treatment and sediment removal.

14. All operations shall be conducted so as to avoid range and forest fires and spontaneous combustion. Open burning of carbonaceous materials shall be in accordance with suitable practices for fire prevention and control. The mining company shall take immediate steps to extinguish any fires in piles of coal wastes or slack, or in an exposed face of in-place coal.

15. The active mining areas shall be posted, fenced, or otherwise protected where necessary to minimize injury to people, livestock, and wildlife.
16. Drill holes shall be temporarily protected at all times so as to prevent injury to people, livestock, and wildlife. They shall be permanently sealed when the need for the drill hole no longer exists.
17. All existing improvements, including but not limited to gates, cattleguards, roads, trails, pipelines, bridges, public land survey monuments, and water development and control structures, shall be replaced, restored, or appropriately compensated for as soon as practicable in the event they are damaged or destroyed by company operations.
18. Surface buildings, supporting facilities, haul roads, and other structures that have served their purpose shall be removed and the area shall be graded and revegetated.
19. Flowing springs, wells, and reservoirs which are eliminated by mining shall be replaced with suitable alternative water development.
20. If an archaeological, paleontological, or historical site is discovered during mining, operations shall immediately cease and the BLM District Manager and other appropriate authorities shall be notified. A reasonable time will be allowed for evaluation or removal of these values.
21. The lessee will be required to comply with all state laws and regulations concerning coal mining.

This Environmental Analysis Record is being made to provide the decision maker with the information necessary to determine if the impacts of leasing the federal coal would be significant enough to require an Environmental Impact Statement.

Following the preparation of this environmental analysis, the BLM's Miles City District Manager must recommend whether an Environmental Impact Statement (EIS) is needed. This recommendation is made to the BLM State Director, BLM Director in Washington, D. C., and Department of the Interior officials.

If an EIS is not recommended, the District Manager uses this environmental analysis and a technical report in accordance with title 43 Code of Federal Regulations, part 23, to recommend favorable or unfavorable action on the proposed lease amendment (or portions thereof). If the recommendation is favorable, stipulations are prepared for the proposed lease amendment (or portions thereof) and forwarded to the BLM State Director.

The U. S. Geological Survey reviews the stipulations, and any technical conflicts are resolved prior to forwarding to the BLM in Washington, D. C. The lease is reviewed and forwarded to Department of the Interior officials for final action.

CHAPTER 2

DESCRIPTION OF THE ENVIRONMENT

CLIMATE

Ward County, which is near the geographical center of North America, has a typical continental climate. The Rocky Mountains to the west effectively modify the maritime air masses from the Pacific Ocean, but there are no obstacles to air movement from the north or south. Consequently, summers are generally dry and warm with occasional hot periods. Winters are usually cold, but temperatures can vary widely. Cold arctic outbreaks can be expected every winter, along with compensating periods of mild weather.

Topographic features of the county exert only a limited influence on the climate; therefore, unless otherwise noted, most of what follows is based upon weather records maintained at Minot, but should be similar to that expected at the mine area (Sanderson, 1963).

Table 2-1 shows the more salient features of the temperature regime throughout the year. Temperatures reach 90°F. or higher on an average of 18 days each summer. The highest temperature recorded at Minot was 109°F. on June 20, 1910, and on July 11, 1936. In contrast, temperatures zero or below can be expected about 55 days each year. The lowest temperature recorded at Minot was 49°F. below zero on February 15, 1936. Parshall, 45 miles southwest of Minot, in Mountrail County, recorded the lowest temperature in the State, 60°F. below zero, on February 15, 1936. The temperature rises above 32°F. on about 24 days during the winter.

TABLE 2-1

TEMPERATURE AND PRECIPITATION DATA

(Data from Minot, North Dakota)

Month	Temperature				Precipitation				
	Average daily Maximum	Average daily minimum	Two years in 10 will have at least 4 days with		Average total	One year in 10 will have		Days with Snow cover 1 inch or more	Average depth of snow on days with snow cover
			Maximum temperature equal to or higher than	Minimum temperature equal to or lower than		Less than	More than		
	°F.	°F.	°F.	°F.	Inches	Inches	Inches	Number	Inches
January	18	-4	41	-28	0.48	0.1	1.1	24	4
February	22	1	45	-25	.44	.1	.9	22	5
March	34	13	57	-11	.63	.1	1.6	15	4
April	53	28	75	12	1.24	.2	2.4	3	2
May	66	40	85	26	2.15	.6	4.3	(1/)	(2/)
June	75	50	91	38	3.25	1.2	5.6	--	--
July	83	55	96	44	2.13	.6	3.8	--	--
August	81	52	95	39	1.87	.5	3.6	--	--
September	70	42	89	28	1.40	.3	3.0	(1/)	(2/)

Month	Temperature				Precipitation				
	Average daily Maximum	Average daily minimum	Two years in 10 will have at least 4 days with		Average total	One year in 10 will have		Days with Snow cover 1 inch or more	Average depth of snow on days with snow cover
			Maximum temperature equal to or higher than	Minimum temperature equal to or lower than		Less than	More than		
	°F.	°F.	°F.	°F.	Inches	Inches	Inches	Number	Inches
October	57	32	79	16	.86	.1	1.8	1	1
Nobember	37	17	60	-5	.70	.1	1.7	9	2
December	24	4	45	-21	.47	.1	1.0	18	3
Year	52	28	3/101	4/-32	15.62	10.9	20.7	92	4

1/ Less than one-half day.

2/ Trace.

3/ Average annual highest temperature.

4/ Average annual lowest temperature.

Table 2-2 shows the probability of freezing after a given date in the spring and before a given date in the fall (Sanderson, 1963). There may be variations of several days from the average dates given due to local terrain effects. The average frost penetration in this area is approximately 4 feet. Frost has been recorded to a depth of 6½ feet.

Precipitation distribution is an important climatic factor. Table 2-1 indicates the average total precipitation distribution in the Minot area. On the average, nearly 50% of the precipitation occurs in May, June, and July, and more than 75% occurs in the entire growing season (April through September). The average annual total precipitation decreases slightly toward the western part of the county, however, the average June total remains uniformly high throughout the county.

The county is subject to large variations in precipitation. At Minot, total annual precipitation ranged from 7.13 inches in 1934 to 28.39 inches in 1975. The greatest amount recorded in a single month was 10.63 inches in June, 1944. Summer thunderstorms occasionally drop large amounts of water in a very short time. Thunderstorms occur on an average of about 30 days each year. Hail can be expected 2 or 3 days each year (U.S. Department of Commerce, 1961).

About 32 inches of snow falls each year at Minot. The seasonal snowfall ranged from 100 inches in the winter of 1949-50, to less than 7 inches in the winter of 1930-31. Nearly 28 inches of snow fell in April 1950, and 17 inches of snow fell in a single day on April 24, 1950. Table 2-1 shows the average number of days the ground is covered with 1 inch or more of snow each month and year.

TABLE 2-2

PROBABILITY OF FREEZING TEMPERATURES LATER THAN SPECIFIED DATES IN SPRING AND EARLIER THAN SPECIFIED DATES IN FALL

(All data from Minot, North Dakota)

Probability	Dates for given probability and temperature				
	32° F. or lower	28° F. or lower	24° F. or lower	20° F. or lower	16° F. or lower
Spring:					
10 percent later than	June 4	May 24	May 15	May 6	April 26
25 percent later than	May 28	May 7	May 7	April 29	April 18
50 percent later than	May 21	May 10	April 29	April 20	April 9
75 percent later than	May 14	May 3	April 21	April 12	March 31
90 percent later than	May 7	April 26	April 13	April 4	March 23
Fall:					
10 percent earlier than	September 3	September 15	September 20	October 1	October 10
25 percent earlier than	September 9	September 21	September 28	October 9	October 18
50 percent earlier than	September 15	September 28	October 6	October 18	October 27
75 percent earlier than	September 21	October 5	October 14	October 27	November 5
90 percent earlier than	September 27	October 11	October 22	November 4	November 13

Water balance, the relationship between precipitation and evapotranspiration, is difficult to evaluate. The potential evapotranspiration is computed by the Thornthwaites method (Thornthwaites, 1955). This method tends to underestimate the true potential evapotranspiration in dry climates; thus the true potential likely lies somewhere between the value that is computed and that shown by the Class A evaporation pan method. At any rate, it is evident that water is generally used at a faster rate than it can be replenished by normal precipitation in the growing season.

Table 2-3 summarizes wind velocities as recorded at the airport at Minot. These data indicate that winds blow more frequently from the northwest than from any other direction in all months of the year. On the average, one-third of all winds of 25 miles per hour or higher blow from the northwest, and 70% of all winds 25 miles per hour or higher blow from the northwest quadrant. The remaining 30% or so are fairly evenly distributed among the remaining directions. Approximately 35% of all winds blow from the northwest quadrant, 21% from the southeast quadrant, and only 14% from the northeast quadrant. The wind is calm less than 2% of the time.

TABLE 2-3

SUMMARY OF WIND AT MINOT, NORTH DAKOTA

(Hourly observations from December 1948 to June 1960)

Month	Wind velocity of						Calm	Average wind velocity	Maximum wind[1/]		Prevailing wind	
	1 to 3 miles per hour	4 to 11 miles per hour	12 to 24 miles per hour	25 to 31 miles per hour	32 to 45 miles per hour	More than 45 miles per hour			Velocity	Direction	Velocity	Direction
	Number of hours	Number of hours	Number of hours	Number of hours	Number of hours	Number of hours	Number of hours	Miles per hour	Miles per hour		Miles per hour	
January	50	322	306	33	10	(2/)	23	12.4	46	NNE	15.9	NW
February	38	308	285	22	7	(2/)	12	12.5	51	WNW	16.6	NW
March	37	338	314	33	10	(2/)	12	12.8	55	W	16.7	NW
April	28	307	329	33	15	(2/)	8	13.6	47	WNW	16.8	NW
May	30	349	319	27	9	1	9	12.7	54	NW	16.2	NW
June	32	361	285	24	9	0	9	12.3	45	WNW	14.3	NW
July	42	426	258	7	1	0	10	10.9	44	WNW	13.7	NW
August	49	418	256	7	1	0	13	10.8	40	N	13.3	NW
September	39	363	272	26	7	(2/)	13	11.9	46	WNW	14.9	NW

Month	Wind velocity of						Calm	Average wind velocity	Maximum wind[1]		Prevailing wind	
	1 to 3 miles per hour	4 to 11 miles per hour	12 to 24 miles per hour	25 to 31 miles per hour	32 to 45 miles per hour	More than 45 miles per hour			Velocity	Direction	Velocity	Direction
	Number of hours	Number of hours	Number of hours	Number of hours	Number of hours	Number of hours	Number of hours	Miles per hour	Miles per hour		Miles per hour	
October	33	383	278	24	7	0	19	11.8	45	NW	15.8	NW
November	33	326	298	35	14	1	13	13.1	52	NW	17.9	NW
December	45	357	294	26	9	(2/)	13	12.2	46	WNW	16.3	NW
Year	456	4,258	3,494	297	99	2	154	12.4	55	W	15.9	NW

1/ Maximum observed 1-minute wind speed and direction from hourly observations, at 30 feet above ground.

2/ Less than 1/2 hour.

AIR QUALITY

The State of North Dakota has established air sampling stations throughout the State. The only station close to the proposed lease site is at Minot, approximately 20 miles northwest of the site.

The Minot station collects and analyzes air samples for total suspended particulates (fugitive dust) using a high-volume sampler. The best available data was taken during the calendar year 1974 (Table 2-4).

TABLE 2-4

TOTAL SUSPENDED PARTICULATES SAMPLED AT MINOT, NORTH DAKOTA - 1974

MONTH - 1974	TOTAL SUSPENDED PARTICULATES (MICROGRAMS/CUBIC METERS)
January	32
February	19
March	46
April	87
May	27
June	137
July	84
August	48
September	40
October	110
November	76
December	28

The State of North Dakota has established ambient air quality standards for particulates at 60 micrograms/cubic meter (ug/m^3), maximum annual geometric mean; and 150 ug/m^3, maximum 24-hour concentration not to be exceeded more than once per year. It appears that the fugitive dust level is a function of the season of the year because of seasonal winds and the exposed agricultural lands.

GEOLOGY

Stratigraphy

The geology of the region has been described by Andrews (1939). The oldest rocks which outcrop in the mine vicinity are continental sedimentary beds of the Tongue River Formation of the Fort Union Group of Paleocene age. This formation consists of interbedded beds of unconsolidated sand, silt, shale, and lignite. The base of this formation is at an altitude of 1,520 to 1,540 feet above mean sea level (MSL). Most of the formation has been removed by erosion. Its maximum thickness in the area is about 400+ feet.

Two main lignite beds occur in this formation - the Burlington bed at an altitude of about 1,640 feet above MSL, and the Coteau bed at about 1,910 feet above MSL which is 11+ feet thick in the proposed lease area. In the general mine area, the Coteau bed averages about 14 feet thick and is overlain by 30 feet or less of overburden materials (Andrew, 1939).

The overburden consists of strata of the Tongue River Formation, and Pleistocene age ground moraine deposits of glacial drift and glacial Lake Souris sediments (both lake bottom and beach deposits) (Lemke, 1953). These beach deposits trend east-west across the southern half of the 120 acre proposed lease area along the mid-slopes of the escarpment landform.

Structure

The beds of the Tongue River Formation are nearly horizontal. However, apparent dips up to 20 feet per mile were recorded on an indurated sandstone bed southwest of Velva by Lemke (1953). He observed no faults or large-scale jointing in the region.

Lignite

The Coteau bed averages 14 feet thick in the mine area and is 11+ feet thick in the 120 acre tract (Andrew, 1939). The lignite averages 6,790 BTU/lb. with a 0.2 to 0.4 percent sulfur content and a 5.2 percent ash content.

Approximately 55 acres of the proposed 120 acre tract have already been mined. The reserves of lignite on the remaining 65 acres are shown in Table 2-5 below.

TABLE 2-5

ACREAGES AND RESERVES OF FEDERAL COAL IN THE PROPOSED LEASE MODIFICATION

Acres of Total Reserves 1/	Total Reserves 2/ (Tons)	Acres of Strippable Reserves	Total Strippable Reserves (Tons)	Total Recoverable Reserves 3/ (Tons)
65	1,592,500	65	1,592,500	1,465,100

1/ This acreage figure includes the original 120 acres minus the 55 acres estimated to have been mined out.

2/ Calculated by: (1) multiplying the total reserve acreage by an estimated cumulative average lignite thickness to 14 feet to obtain the volume of coal in acre-feet. This figure was then multiplied by 1,750 tons/acre-foot (the average weight of lignite coal - Averitt, 1974) to yield the total reserve tonnage.

3/ This tonnage is obtained by multiplying the total strippable reserves by a recovery factor of 92%.

Paleontology

Fossils in the area are negligible in both abundance and significance.

TOPOGRAPHY

The topography of the area is mapped on the U. S. Geological Survey 15 minute Kongsberg (North Dakota) Quadrangle (see Figure A2-1, Appendix 2). he proposed lease area is situated in the Coteau du Missouri section of the Great Plains physiographic province. The Coteau is a conspicuous, high area with a northeast-facing escarpment. The Coteau trends northwest-southeast from the northwest corner to the south-central portion of North Dakota. This upland feature consists of a high bedrock capped with a veneer of hummocky glacial drift. The 120-acre proposed lease area lies on the relatively steep sloping escarpment. This escarpment is carved in bedrock, but it has a surface veneer of glacial drift and glacial Lake Souris sediments. The base of the escarpment is the dividing line between the Great Plains physiographic province on the west and the Drift Prairie section of the Central Lowland physiographic province to the east.

The topography of the area (see Figure A2-2) is relatively simple and consists of only four primary landforms - plateau, escarpment, drift prairie, and mined land. These four landforms are delineated in cross section in Figure A2-2 and are defined as follows: (1) plateau - the hummocky upland surface of the Coteau du Missouri which occurs immediately west and south of the 120-acre tract; (2) escarpment - the relatively steep slope separating the plateau or uplands on the south from the drift prairie landform to the north and east. (The 120-acre tract lies completely on this landform.); (3) drift prairie - the gently rolling glacial drift covered grasslands northeast of the mine area; (4) mined land - man-made features such as highwalls, cuts, spoils piles, etc.

The plateau surface ranges in altitude from about 2,060 to 2,160 feet, that of the escarpment or cliff-like feature ranges from about 1,650 to 2,060 feet, and the drift prairie landform lies below about 1,650 feet. The elevation ranges from 1,960 feet to 2,090 feet above sea level in the 120-acre proposed lease area.

WATER

Surface Water Characteristics

The Consolidation Coal Company mine is located in the Souris River basin. The basin is located on a gently rolling ground moraine plain with generally low relief. A few intermittent streams, located in old glacial ice-margin channels, cross the plain, and potholes are abundant throughout the area. Potholes, small lakes and sloughs are evidence that the area is poorly drained. These numerous water bodies are generally saline and of poor chemical quality for most domestic and municipal purposes, as well as some agricultural irrigation uses (Pettyjohn and Hutchinson, 1973).

The Souris River is the only perennial river in the area and drains most of Ward County and adjoining McHenry County. The river meanders throughout the area inside a wide, nearly flat flood plain. Along its route are a number of surface water monitoring stations. U.S. Geological Survey (USGS) station #5-120000, near Verendrye below the mine area, is the closest surface water monitoring station to the mine. This station shows an average discharge for the Souris of 178 cubic feet per second (cfs), with a minimum daily discharge of 5.5 cfs and a maximum discharge of 3,430 cfs. According to records from this station, water quality of the Souris River is variable (see Table A2-1). The water appears to be a sodium bicarbonate type with a broad Total Dissolved Solids (TDS) range, of 365 to 1,200 parts per million (ppm). Water quality is influenced by the season of year, and the amount and intensity of precipitation.

From late fall to early spring, when most of the flow is attributed to ground water discharge, the water is more mineralized than during other times of the year. The water generally has the highest concentration of dissolved solids in November and December and the lowest concentrations in April during spring runoff (Pettyjohn and Hutchinson, 1971).

The drainage system is consequent in nature. The prominent surface drain for the mine is Spring Creek, flowing intermittently in a northerly direction, which empties into the Souris River near Velva. Most of the Spring Creek flow occurs during the spring and following frequent thunderstorms in June, July, and August. Water flows into the mine pits as a result of seasonal precipitation and ground water inflow. Generally this water is pumped continuously from the pits and discharged at a rate of from 150 to 375 gpm (gallons per minute) into Bowers Coulee, a tributary of Spring Creek. Some of this discharge finds its way into Spring Creek and the Souris River (Consolidation Coal Company, 1976). While the mine is pumped continuously, the discharged water only flows seasonally. In the winter this water freezes shortly after being discharged and does not appear to flow on into Spring Creek.

Discharged water quality is poorer than that of the Souris River, and approximates the ground water quality of Ward and McHenry Counties. The mine area water has a pH range of 7.8 to 8.5; is high in sodium, ranging from 2,000 to 3,300 milligrams per litre (mg/l); is high in total alkalinity, ranging from 400 to 1,485 mg/l; and has a wide range, from low to very high, of sulfates. The effects of this water on soil and vegetation could prove harmful to most plants, and consequently is considered unsuitable for irrigation (Consolidation Coal Company, 1976).

Suspended solid concentrations parallel seasonal precipitation with an increase during the spring and summer season. Currently these concentrations are low, ranging from 1 to 65 mg/l (Consolidation Coal Company, 1976).

A reservoir was constructed at the head of Spring Creek, below the mine area, by the Velva Wildlife Club. The reservoir has a holding capacity of 66 acre feet, averages 15 feet in depth, and covers 5.8 surface acres (U. S. Department of Agriculture, undated). It is fed by ground water inflow and precipitation runoff. The reservoir receives runoff from an estimated 600 acre area, part of which has been mined, thus resulting in a high siltation rate (U. S. Department of Agriculture, undated). No discharge water from the mine pits is allowed to enter the reservoir or its drainage area (Consolidation Coal Company, 1976).

Poor drainage south of the mine is reflected by numerous potholes and sloughs. These prairie potholes and sloughs are water holding depressions of glacial origin averaging 2 to 5 feet in depth. Water is supplied by direct precipitation, basin runoff, and seepage inflow of ground water. Depletion of pothole water is a result of evapotranspiration, overflow, which rarely occurs, and seepage outflow (Sloan, 1972).

Permanent potholes must have basin inflow larger than depletion factors. The total amount of water lost by evapotranspiration from May to October is roughly 30 inches. Precipitation on a pond surface averages about 12 inches, leaving about 18 inches to be replenished by runoff and ground water inflow (Eisenlohr, 1972).

All water, except direct precipitation entering a pothole, contains some dissolved solids. The only natural means of removing these dissolved solids is by overflow, which rarely occurs, and seepage outflow. Evapotranspiration removes only pure water resulting in higher concentrations of dissolved solids. If a pond dries completely, minor amounts can be removed by wind and bacterial action transforming dissolved solids into gasses. Seepage outflow is the major contributing factor in removing dissolved solids from a pothole. At a pothole where the rate of seepage outflow is high, water will be relatively fresh. Where there is little or no seepage outflow, the solids will accumulate and the water can range anywhere from brackish to brine. See Table A2-2. (Eisenlohr, 1972).

Ground Water Characteristics

The mine near Velva lies within the regional Des Lacs artesian discharge area. This is a belt of about 870 square miles that parallels much of the Des Lacs and Souris Rivers.

Major ground water aquifers appearing in geologic units of Cretaceous and Tertiary Age, underlie the mine area (see Table A2-3). Generally, the aquifers used for water supplies are located above the Fox Hills Formation. For practical purposes the formation below the Fox Hills forms the base of the fresh water bearing units.

The Fox Hills Formation is about 900 feet below the mine area. It is about 200 feet thick, and consists of equal amounts of sandstone and shale. Currently there are no known wells in the area producing from this aquifer. Regionally the wells penetrating this aquifer are under artesian pressure, but generally do not flow. Water from this aquifer is slightly saline, but can be used for most domestic and municipal needs (Pettyjohn and Hutchinson, 1971).

The Hell Creek Formation overlies the Fox Hills and consists of fine to medium grained sandstone, siltstone, and shale. The aquifer does not yield large quantities of water. Generally the water from this aquifer is slightly saline, but is suitable for most purposes (Pettyjohn and Hutchinson, 1971).

The Fort Union Group overlies the Hell Creek Formation and is composed of four geologic formations. These formations, in ascending order, are the Ludlow, Cannonball, Tongue River, and Sentinel Butte. The Fort Union Group has a total thickness of about 600 feet. The lignite and fine grained sandstone layers are a source of water for wells and springs. In most areas the lignite beds are underlain by clay, which restricts the downward movement of ground water. As a result ground water collects in the lignite beds and moves laterally to discharge areas. Generally this discharge is small. Aquifer recharge is a result of underflow from the southwest and by infiltration of precipitation along outcrops and overlaying glacial deposits.

Water quality measurements of the Fort Union Group varies. Generally, the water is a sodium bicarbonate type. Total dissolved solid concentrations vary from 3,640 ppm for the Cannonball Formation, to 2,090 ppm for the Cannonball-Tongue River Formation, to 1,790 ppm for the undifferentiated Ludlow-Tongue River Formation. Generally, water from the Fort Union Group is intermediate in chemical quality. This water is not well suited for domestic or agricultural use because of its high concentrations of sodium and dissolved solids. However, this water is used for livestock purposes and some domestic needs (see Table A2-4). (Pettyjohn and Hutchinson, 1971).

SOILS

Most of the soil data in this introduction and in the Appendix is from the publication, "Soil Survey of Ward County, North Dakota" by the U.S. Department of Agriculture, Soil Conservation Service (SCS), issued in 1974.

The soils of Ward County are forming in calcareous loamy or coarse sandy and gravelly glacial till materials of the Coleharbor Formation of Pleistocene age. This formation is 9,000 to several hundred thousand years old. Geologically, the soils are young and in general show little development. The raw till contains significant amounts of calcium sulfate and 5 to 15 percent calcium carbonate.

Soils were identified and mapped at the series and type level, which is the most specific level of soil identification. Four soil series and one miscellaneous land type (mine pits and dumps) were mapped in the Consol-Velva Mine area. See the Appendix 2, page A2-10 through A2-14 for soil descriptions, soil maps, tables of soil characteristics and properties, and soil series classifications.

The SCS general soils map shows that the Velva Mine area is in the Williams-Bowbells Association. These are well drained and moderately well drained, nearly level, dark brown, loamy soils forming in glacial till. These two soils and the Zahl loam make up about 39% of the area of the proposed 120 acre coal lease. All three are suited for use as the final cover of strip mined lands. The other soil unit mapped in the vicinity is Wabek soils. These soils are sandy and gravelly and are consequently droughty. They make up about 15% of the area and are only marginally suited as final cover for strip mined land. Mine pits and dumps (spoil piles) make up about 46% of the area.

VEGETATION

The Velva Mine area lies along the transition zone dividing the Missouri Coteau and Northwestern Drift Plain divisions of the Prairie Pothole biotic region. The vegetation is typically ecotonal (well mixed). Küchler (1964) has identified this area as the Wheatgrass-Bluestem-Needlegrass (*Agropyron-Andropogon-Stipa*) or Wheatgrass-Needlegrass (*Agropyron-Stipa*) physiognomic types. Oosting (1956), Odum (1959) and the Northern Great Plains Resource Program (NGPRP, 1974) classify this area as the mid-grass prairie biome, or ecosystem.

Vegetation of the Missouri Coteau is characterized by short and medium height grasses. Prominent species include western wheatgrass (*Agropyron smithii*), needle-and-thread (*Stipa comata*), blue grama (*Bouteloua gracilis*), threadleaf sedge (*Carex filifolia*) and Sandberg bluegrass (*Poa secunda*) (Renhowe, 1975). At the Velva Mine, this type coincides with the thin silty range site described by the U. S. Soil Conservation Service (U. S. Department of Agriculture, 1975; see Appendix 2), and comprises approximately five acres (3%) of the subject coal lease. The vegetation here is dominated by medium to tall growing shrubs and a few scattered trees (i.e., chokecherry [*Prunus virginiana*], snowberry [*Symphoricarpos* spp.], silverberry [*Elaeagnus commutata*], rose [*Rosa* spp.], green ash (*Fraxinus pennsylvanica*), and quaking aspen (*Populus tremuloides*)). Stewart (1975) refers to this type of brushy vegetation complex as a "prairie woodland thicket". These grass and shrub species could be expected to prevail as "climax" vegetation in this area under natural conditions.

The dissected slopes and drainages (Bowers Coulee, Spring Creek, Blacktail Coulee) of the escarpment, leading away from the Missouri Coteau Plateau and toward the Souris River, cut across the mine area. The natural vegetation on the slopes overlying federal coal is characteristic of the silty and shallow-to-gravel range sites (U. S. Department of Agriculture, 1975) and has a predominately "brushy" aspect. The silty range site comprises approximately 45 acres (38%) of the coal lease tract. The shallow-to-gravel site occupies approximately 14 acres (12%). Characteristic plant species on the undisturbed "brushy" sites include chokecherry, silverberry, snowberry, and rose, while on the grass dominated sites, smooth brome (*Bromus inermis*), green needlegrass (*Stipa viridula*), western wheatgrass, junegrass (*Koeleria cristata*), Kentucky bluegrass (*Poa pratensis*), and slender wheatgrass (*Agropyron trachycaulum*) are prevalent. A variety of forbs may be found in these range sites. Those sites with a natural "brushy" aspect will be referred to as "prairie woodland thickets" and grass dominated sites will be titled "upland grasslands".

Ward County, including the Velva mine vicinity, is highly agricultural. Approximately 31 acres (26%) of the surface acreage over the subject federal coal is cultivated. The cultivated area coincides with the silty range site. In April 1976, the cropland (cultivated) area was in fallow. Indications are that this field has been used for the dryland farming of small grain.

A large portion (approximately 56 acres; 47%) of the proposed coal lease tract has been disturbed by past mining. Most of the disturbed area (mine spoils banks) is vegetated by "pioneer" plants, representative of early successional stages. Some of the spoils have been artifically vegetated in the reclamation process, although no reclamation has been accomplished in the proposed lease area. At present, the spoil banks are relatively well vegetated by smooth brome and wheatgrasses (Agropyron spp.). At some sites, quaking aspen and cottonwood (Populus spp.) have become established in the trenches between the spoil banks.

Numerous wetland ponds occur on the plateau of the Missouri Coteau adjacent to the subject coal lease tract. These wetlands vary in size and form from Type 1 through Type 5 as described by Shaw and Fredine (1971). No natural wetlands occur directly on the surface lands overlying the proposed lease tract. Small artifically formed ponds (classified Type 5) have been created by drainage into the final and headwall pits of the former mining operations (see Appendix 2). Shoreline vegetation at these sites is variable, but usually consists of invader grass and shrub species intermixed with some cottonwoods and willows (Salix spp.). Little, if any, emergent vegetation exists in these ponds. A recreation reservoir is located approximately ½ mile north of the coal lease tract. This pond, roughly 5.8 surface acres in size, is surrounded by the "brushy" vegetation typical of this region. This pond is classified as a Type 5 wetland.

Endangered or Threatened Plant Species - Relict Areas

The SCS describes sites of climax vegetation that have not been disturbed by man, either through grazing or any other means, as "relict areas". Since the entire Velva Mine area has been subject to agricultural practices for many years, it is doubtful that any relict areas are present.

Three species of plants in North Dakota are considered "candidates" for listing as endangered or threatened species. These three species are Yellow Marsh Cress (*Rorippa calycina*), Small White Ladyslipper (*Cypripedium candidum*), and Prairie Fringed Orchid (*Platanthera leucophaea*). Occurrence of these species in the Velva Mine area is undetermined at this time. Dr. William Barker of North Dakota State University has conducted an intensive analysis of plant historical records of North Dakota (Barker, et.al., 1976). He contends that North Dakota has no "endangered" species, as such, but that several species could be considered "rare" or "unique" within the North Dakota state boundaries. An annotated list of 130 species considered "rare" or "unique" in North Dakota has resulted from this research study. Several of these species recorded in Ward or McHenry County include: moonwart (*Botrychium lunaria*), marsh fern (*Thelypteris palustris*), sedge (*Carex richardsonii*), sedge, (*Carex scirpiformis*), willow (*Salix pedicellaris* var. *hypoglanca*), sedge mousetail (*Myosurus aristatus*), and bursage (*Ambrosia acanthicarpa*). Some of these species could feasibly occur in the Velva Mine area, although this is undetermined at present.

ANIMALS

Little significant aquatic habitat for major aquatic animals occurs on the proposed lease tract. Zooplankton and aquatic macroinvertebrates are expected to occur where aquatic habitat is present, although no site-specific surveys of these aquatic animals are available for the coal lease tract. The status of these populations is variable and depends on the momentary condition of the aquatic habitat. The zooplankton and macroinvertebrate populations found on these wetlands are regarded as important seasonal items in the food chains of the higher animal forms (i.e., fish, waterfowl).

Due to their small size and temporary nature, none of the natural wetlands in the immediate mine vicinity are expected to maintain fish populations. The Institute for Ecological Studies (Seabloom, 1973) reporting on an area in McLean County, indicated that sticklebacks (Eucalia inconstans) and golden shiners (Notemigonus crysoleucas) are widely distributed in North Dakota and commonly inhabit warm, weedy lakes, sloughs and ponds. These species could be present in some of the larger more permanent ponds in the Velva Mine vicinity, although no information is available to verify this. The same situation exists for the coal mine pit ponds on the subject coal lease tract. The Velva Sportsman's Dam, north of the lease tract, has been stocked and maintained with fingerling and adult rainbow trout for several years (North Dakota Game and Fish Department, 1976).

Since no site-specific faunal reconnaisance information presently exists for the Velva coal lease area, status and distribution data for reptiles and amphibians is lacking. Wheeler and Wheeler (1966) have developed a comprehensive synopsis of the amphibians and reptiles of North Dakota. This source provides a species list which may be extrapolated to infer species occurrence in the Velva vicinity.

No site-specific distribution or population status information exists for the lease area, however, several comprehensive works on the bird-life of North Dakota are pertinent and may be extrapolated for this immediate area. Stewart and Kantrud (1972) established the relative abundance of breeding birds in North Dakota by determining population estimates. Stewart (1975) has presented an extensive analysis of the breeding birds of North Dakota (See Appendix 2). Due to the diverse habitat complex at the coal lease site, a rich contingent of bird-life could be expected to occur there. Waterfowl is by far the most abundant category of major wildlife. The Velva Mine lies within central flyway and the immensely productive prairie pothole biotic region, which is well known for its vast waterfowl breeding grounds. The North Dakota State Game and Fish Department (NDG&F) (Renhowe, 1975) and the Northern Great Plains Resource Program (NGPRP, 1974) consider the Missouri Coteau and drift prairie excellent waterfowl habitat. Sharp-tailed grouse (Pedioecetes phasianellus) populations and habitat are considered high to medium in value throughout District VI of the NDG&F (Renhowe, 1975). The lease tract contains blocks of native grass and brushlands (sharptail habitat), and as such, could be expected to partially support a sharptail population. Renhowe (1975) indicates high to medium Hungarian partridge (*Perdix perdix*) values for populations and habitat throughout District VI (including the Velva Mine vicinity). "Huns" could be expected to utilize the coal lease tract in its present state. Pheasant (*Phasianus colchicus*) populations and habitat values in District VI are rated as low to medium (Renhowe, 1975). Some of the lands overlying the subject coal lease tract meet the criteria for pheasant habitat, and pheasants do occur there. The Velva Mine area lies in the migration path (flyway) of the whooping crane (*Grus americana*), an endangered species. However, there are no known records of whooping crane use of the Velva Mine site and no habitat for whooping cranes is present there. The peregrine falcon (*Falco peregrinus*), an endangered species, historically ranged into North Dakota (Stewart, 1975), however, there is no known record for these animals on the Velva Mine site. McKenna and Seabloom (1976) discuss some of the population and habitat implications of these endangered species.

No site-specific information on distribution and status of mammal populations for the Velva Mine site is available. Bailey (1926) developed a comprehensive survey and account of the fauna of North Dakota. Much of this information can be extrapolated for the Velva area. A few mammal species of economic and recreational importance can be found in the Velva vicinity. Adams (1961) discusses the distribution and ecology of the furbearers of North Dakota. Many of these animals can be found in this region. Muskrats (*Ondatra zibethica*), raccoons (*Procyon lotor*), mink (*Mustela vison*), long-tailed weasels (*Mustela frenata*), striped skunks (Mephitis mephitis), red foxes (Vulpes fulva), white-tailed jackrabbits (Lepus townsendi), and eastern cottontails (Sylvilagus floridanus) could be expected to occur on the subject coal lease tract. Less common furbearers that may be present include: least weasel (Mustela rixosa), badger (Taxidea taxus), and coyote (Canis latrans). White-tailed deer (Odocoileus virginianus) are the most prominent game animal in the Velva Mine area. A site inspection of the lease tract in April, 1976, revealed abundant sign (tracks, droppings, browse plant hedging, etc.) of deer use on the area. The abundance of interspersed forage and cover (both vegetative and mechanical) provides ideal conditions for white-tailed deer. During the same site inspection, pronghorn antelope (Antilocapra americana) were observed immediately west-southwest of the mine area on the plateau of the Missouri Coteau. Renhowe (1975) rates pronghorn populations and habitat as medium to low for this portion of District VI. No mammals officially considered as endangered or threatened (i.e., published in the Federal Register) are known to occur in the Velva Mine area.

A detailed species list is included in Appendix 2.

ECOLOGICAL PROCESSES

Ecoclass

Because landforms are an important part of the environment, broad natural relationships may be expressed by relating landforms and associated features as Ecological Land Units (ELU's). ELU's are geographic areas which are separated and named according to landform and vegetation (Corliss and Pfister, et. al., 1973). Each has individual elements (landform, vegetation, soils, water, wildlife and human values) which make it different from other ELU's. Each also has a particular degree of interdependence of the natural elements within the ELU. This relationship is shown in Appendix 2, Page A2-33.

The cross section in Appendix 2, Page A2-2 illustrates the characteristic landforms which make up the ELU's found in the Velva Mine vicinity. The landforms over the proposed lease tract are (1) Plateau, (2) Escarpment, and (3) Mined area.

These three landforms are subdivided into three natural and two artifical ELU's. These ELU's also show relationship between landform and vegetative type:

TABLE 2-6

ECOLOGICAL LAND UNIT (ELU) NAMES

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1. a. Plateau - Prairie Woodland Thicket (P-PWT)

2. a. Escarpment - Prairie Woodland Thicket (E-PWT)
   b. Escarpment - Upland Grassland (E-UG)
   c. Escarpment - Agricultural Lands (E-AG)

3. d. Mined Area - Disturbed Site (MA-DS)

The acreages of the Velva coal lease tract ELU's are shown below:

TABLE 2-7

ACREAGE AND PERCENTAGE ESTIMATES
(ELU's on the Velva Mine coal lease tract - W½SE¼ and SE¼SE¼ of Section 1, T. 151 N., R. 81 W. - Velva, North Dakota)

ELU		Acres 1/	% of lease tract
P-PWT	(1a)	5	3%
E-PWT	(2a)	19	16%
E-UG	(2b)	9	8%
E-AG	(2c)	31	26%
MA-DS	(3d)	56	47%
TOTAL AREA		120	100%

1/ Acreage estimates were made with the aid of a dot-grid acetate overlay (Scale = 1120 dots/640 acre section)

Appendix 2, Page A2-34 shows ELU's on the coal lease tract (1975 black and white print of a color infra-red photo base). ELU boundaries may imply definite breaks in relationships, however, some boundaries between ELU's are diffused, and some ELU's contain portions of other ELU's too small to be mapped individually (see Appendix 2, Photos, pages A2-35 through A2-37 for pictures of the ELU's on the coal lease tract).

Unique Ecosystems (Environmentally Sensitive Areas)

A unique community is sometimes defined as " . . . one which is extremely limited in extent or occurrence and/or possesses attributes of special academic interest." Using this definition, the proposed Velva lease tract does not appear to be "unique." Both the floral and faunal communities found there occur throughout the physiographic region and do not possess any particular academic significance.

Environmentally sensitive areas have been defined as " . . . ecologically fragile and consequently extremely vulnerable to destruction . . ." (Smithsonian, 1974). The shrub complex found on this tract, while not truly "fragile", does represent a marginal plant community that is highly dependent on the microclimate conditions of the specific site. For this reason, the shrub complex could be considered environmentally sensitive.

Succession - Climax - Limiting Factors

Approximately 87% of the subject coal lease tract surface lands are disturbed by agricultural cultivation, or strip mining and related facilities, therefore, the natural succession (orderly process of community change) has been altered. The remaining area is largely rangeland subject to grazing by domestic livestock. As a result, this rangeland exists in varying degrees of disclimax. Since the entire range area is accessible to domestic livestock, it is unlikely that vegetative "relict" areas exist in the proposed coal lease tract. At present, in this biome (the largest land community unit which is convenient to recognize), the principal environmental limiting factor for vegetative growth is the seasonal availability of moisture for plant growth. Many of man's land use practices limit native vegetation and wildlife. The Northern Great Plains Resources Program (NGPRP, 1974) indicates this region to have "good" rehabilitative potential following surface land disturbance.

Community - Food Relationships

The proposed Velva coal lease tract has a relatively high natural diversity (see Appendix 2, Page A2-38). Wildlife habitat does not appear to be severely limited or infringed upon at the proposed lease tract. Most ecological "niches" are filled with native species. Some of the "niches," however, are filled or replaced by agricultural plantings and introduced species. Existing plant communities are well mixed. The natural food chain relationships remain well represented at all trophic (food) levels, with the possible exception of large herbivores (plant eating animals) and large carnivores (meat eating animals). Large carnivores are scarce, and large native herbivores have been replaced by domestic livestock in some cases. Natural nutrient cycles may have been altered through fertilization of croplands for agricultural production.

CULTURAL RESOURCES

The lease application lands lie in an area which is not well known archaeologically (see Appendix 2 for archaeological-historical summary). The State Historical Society of North Dakota's cultural resource inventory of the region includes reports of Indian campsites, stone circle sites, stone cairns, and a few burials. However, there is not yet enough data available to allow a detailed description of how the area was used by prehistoric people (Personal Communication, Nick Franke). There are no sites in the area listed on the National Register of Historic Places.

The potential for locating cultural resources in the lease application area is unknown. However, the Velva mine rests on the ecotone between two major physiographic regions, the Missouri Plateau and the Central Lowland. Animal and plant species are typically more diverse in such areas and prehistoric man may have found that this environment provided a variety of foods and essential resources.

Consolidation Coal Company has contracted with the Historical Society for a cultural resource survey of some Velva Mine tracts. But the 65 unmined acres which are the subject of this analysis have not yet been inventoried or contracted for inventory (Personal Communication, Nick Franke).

AESTHETICS

The scenic quality of the proposed coal lease and the adjacent area was rated according to procedures in the BLM Visual Resource Management Manual. This procedure involves assigning numerical ratings to various factors affecting scenic quality. The area received a score of 8 out of a possible 24. See Appendix 2, pages A2-51 to A2-54, for a detailed description of the rating procedure.

The area lies within the Souris River Drainage of the "Dakota-Minnesota Drift" region described by the Northern Great Plains Resource Program (1974). Major scenic interest in the area is provided by the meandering Souris River with its clumps of trees and lakes. Land patterns include the extensive cultivated fields, windbreaks, roads, and telephone and power lines. The seasonal presence of waterfowl provides the major visual wildlife interest.

The overall characteristic of the landscape is a vast, open, gently rolling plain which is broken by low ridges of hills, shallow draws, and poorly developed streams. The major scenic value derives from the contrast and variety provided by the woody vegetation along the streams and draws.

Mining operations adjacent to the proposed coal lease created some aesthetic changes in the area (see photos in Appendix 2, pages A2-35 through A2-37). Unreclaimed spoil piles create a strong form element which is lacking in the natural landscape. Vegetation and color patterns are disrupted. The use of heavy equipment and trucks increase dust and noise levels in the mine area. Noise levels are not high enough to be considered particularly offensive to the average person.

RECREATION

The proposed coal lease does not contain any developed recreation sites. The major recreation use potential of the lands involved is hunting upland game and deer. The ongoing mining operations on adjacent land has, for all practical purposes, eliminated this use on those lands being actively mined.

The developments associated with Lake Sakakawea provide the major public outdoor recreation opportunities near the proposed coal lease. A list of outdoor recreation areas (in Ward, Mountrail, and McLean Counties) and available facilities is included in Appendix 2, Tables A2-6, 7, 8.

No attempt was made to determine the availability of indoor recreation facilities such as bowling alleys, theaters, etc. Sports and game facilities (i.e., baseball fields, golf courses, etc.) are included in Appendix 2, Tables A2-6, 7, 8.

The 1975 North Dakota State Comprehensive Outdoor Recreation Plan included a determination of recreation facility needs. This study (based on 1973 data) indicates that use demand exceeds the available supply of recreation facilities for nearly every activity.

SOCIO-ECONOMIC CONDITIONS

The Velva Mine has been a part of the social and economic structure of communities in Ward, McHenry, and McLean Counties for the past 47 years. Consolidation Coal's production at the mine has been fairly constant since the 1960's, providing stable export base employment. The entire mining industry in the three counties contributed only .3% of the total employment in 1970; 118 jobs. The industry provided .6% of the total earnings for the region in the same year (BLM, 1975). While mining is not a major economic factor in the three counties, the Velva Mine may be significant to small communities near the mine such as Velva, Ruso, and Benedict.

Consolidation Coal employs 37 workers at the Velva Mine at an average hourly wage of $7.00 (Personal Communication, Consolidation Coal Company). The rate of coal production from the mine has been fairly constant for several years and employment levels have stablized. The mine is a small contributor to present socio-economic conditions in the area and indirectly to the broader region which uses power produced by the Neal Power plant at Voltaire, North Dakota, a consumer of Velva coal.

Two 1974 studies in North Dakota's coal mining regions attempted to determine the attitudes of local residents toward energy development (Lemmerman, 1974; Beckel and Markell, 1975). Both studies indicated an overall favorable opinion of mining, especially in areas where mining is an established industry. Some of the people who participated in the studies expressed apprehension about the possible construction of coal gasification plants in their region and many people wanted strong state controls over mining concerns (Ibid.).

LAND USE

The proposed lease area is used for dryland farming, livestock forage, and wildlife habitat. There is some previous mining activity on the northern portion. The surrounding land uses are similar.

Farming practices include crop rotation and summer fallowing. Crops produced are small grains, alfalfa, and native grass hay. Livestock grazing occurs on native range in the summer, and on cropland in the fall. The area has a diverse vegetative cover and offers excellent wildlife habitat.

Access is good, via a system of well maintained county roads. An improved county road traverses the south side of the subject tract.

There are no improvements on the subject tract.

The following is an acreage listing of each type of land use on the proposed lease: mine spoils - 56 acres; cropland - 31 acres; native range - 33 acres; for a total of 120 acres.

CHAPTER 3

ENVIRONMENTAL IMPACTS

This chapter discusses the impacts which would be expected if the proposed action were put into effect. It is assumed that the required mitigating features discussed in Chapter 1 would be incorporated. Chapter 4 contains additional mitigating measures developed as a result of this analysis.

Several constraints and limitations were necessary to formulate and conduct a comprehensive impact analysis.

The impact analysis ratings varied in relation to the resource being analyzed. For instance: one impact rating on aesthetics is warranted if strip mine spoils are viewed from within a mine by a mining engineer while a different perspective and impact rating might be assigned to the same spoils banks when viewed from the air by a landscape architect. Likewise, impact ratings for wildlife may vary from highly beneficial to strongly detrimental for the same operation depending upon the season of year and/or environmental protection measures incorporated in the project. All impact ratings are ordinal in nature and not absolute in quantitative value. The impacts assessed in this analysis are "anticipated", or prospective in nature since the action has not yet taken place. Therefore, no detailed quantitative impact analysis data presently exists for this site.

Each implementation stage and discrete operation was considered independently during the analysis. Usually, the present environment would be considered neutral, and any movement from neutral would be assigned a positive or negative value. For the purposes of this analysis, this is the case during the mining stage. The condition following mining (prior to beginning reclamation) is considered neutral again. Therefore, the positive or negative trend of reclamation is expressed in relation to the last condition (neutrality). Thus, the analysis does not evaluate whether the environment is returned to its original pre-mined condition.

Appendix 3 contains the analysis work sheets which were used to rate the expected impacts in terms of magnitude and direction (beneficial or adverse). The ratings (Low, Medium, High, or insignificant) are ordinal in nature, and based on a consensus of the specialists preparing the document.

CLIMATE

Mining would destroy all vegetative cover, and remove its shading effect. The air temperature would increase and the changes in the landform would alter the direction and flow of air. The impacts would affect only the microclimate.

Reclamation would not duplicate the exact conditions prior to mining, but a similar landform would be replaced. The similar topography combined with revegetation would benefit the microclimate. Vegetation acts as a buffer against extremes of temperature and would assist the establishment of successionally more advanced vegetation. The general air movement and air temperatures throughout the area will not be affected by the action.

AIR QUALITY

The entire mining process would result in negative low impacts due to increases in particulate matter for the duration of the mine. During some periods of the year, high winds could cause the ambient air standards to be exceeded locally, but in order to continue operations, State air quality standards must be met.

Exhaust emissions caused by heavy equipment would increase. This would result in a negative impact that is insignificant outside of the proximity of the operating engines.

Fugitive dust would also increase during reclamation. Regrading and top-soiling will create most of the impact because of the use of heavy equipment and would continue to occur during the life of the mine.

Exhaust emissions would also be increased by reclamation, but would not create a significant impact.

GEOLOGY

The main impacts on the geology component would be expected to occur during the overburden and coal removal stages of operation. The integrity of the sedimentary strata comprising the overburden and that of the coal bed would be destroyed. The paleontological values within these geologic materials are negligible, but they would also be destroyed.

TOPOGRAPHY

The major impact on the topography component would occur during the overburden removal stage of the mining operation. Overburden removal by draglines, to depths often exceeding 40-50 feet, would radically modify the natural topography.

WATER

The on-going mining operation has already altered the hydrologic characteristics of the area. For this reason, the mining of federal coal would have few additional impacts on the water resources of the area.

Hydrologic Cycle

Removal of topsoil would cause changes in runoff, interception, infiltration, percolation, and evapotranspiration. The stockpiled topsoil could experience an increase or decrease in porosity and permeability depending on the mine's operation. The increase would be the result of the breaking up and mixing of the material. The decrease could be the result of compaction by heavy equipment.

The removal of the overburden and spoil piling operations would further disturb the area's ground water characteristics because the material directly over the lignite and the lignite itself make up the aquifer.

Coal excavating would also have adverse impacts on ground water throughout the entire mine area. Removing the coal would eliminate the aquifers. If clay layers underlie the lignite, they may cause the ground water to flow laterally upon removal of the lignite. This may increase ground water discharges in low laying areas down dip from the mine. If the clay is not present, water would infiltrate to the next lower impervious layer.

Reclamation would benefit the disturbed area's hydrologic cycle. Regrading the overburden would partially restore the pre-mining topography and influence hydrologic characteristics. It should increase porosity and permeability until compaction or subsidence occurs. This may increase local ground water accumulation.

Topsoiling would further re-establish the pre-mining hydrologic cycle. The placement of topsoil on the regraded spoils would increase infiltration, promote interception, and establish a runoff cycle. The mixed topsoil would increase water holding capacity and facilitate revegetation. Revegetation would, over time, stabilize the hydrologic cycle.

Sediment Load

Runoff and ground water inflow from the mine area would collect in the mine pits and be pumped into Bowers Coulee north of the mine. The Coulee would act as a sediment trap.

Removal of topsoil would cause sediment from the stockpiled topsoil and exposed overburden to increase. The stockpiled topsoil would contribute to the sediment load until it stabilizes. The exposed overburden would increase the sediment load because of its susceptibility to erosion. The amount of sediment load would vary seasonally. It would also vary with the length of time the materials are exposed prior to stabilizing.

During overburden removal, sediment load may increase as a result of seasonal runoff and ground water inflow.

Additional sediment resulting from coal excavation would be minimal. Some material could be placed in suspension as a result of ground water inflow and seasonal runoff coming in contact with the broken lignite.

Grading the spoil piles would effect the area's sediment load by reducing the gradient of the spoils. Grading may adversely affect sediment load during early phases of the operation by disturbing stabilized spoil piles. The replaced topsoil would be susceptible to erosion causing increased sediment loads until revegetated. Revegetation should reduce the amount of material removed by erosion.

Water Quality

In this report, water quality will encompass dissolved solids, chemicals, heavy metals, toxic substances, nutrients, solid debris, coliform contamination, pH, dissolved oxygen, and temperature. Dissolved solids are an indicator of water suitability. The suitability of water decreases with an increase in dissolved solids. Chemicals, heavy metals, and toxic substances are relatively unknown in the local area. Solid debris and coliform contamination is not a problem. Acid balance (pH) should remain much the same throughout the mining operation with the possible exception of the revegetation process. The ability of water to hold oxygen decreases as temperature and dissolved solids increase. This is not a major concern in the mine area because aquatic habitat is limited. Temperature can also alter the water quality. An increase could contribute to undesirable conditions such as decreased oxygen and the growth of taste and odor producing organisms.

The water quality of the area will vary according to the time of the year and the volume of water. Generally, chemical concentration will increase with decreased volume or an increase in chemicals encountered. Chemical concentrations can be diluted by an increase in water volume.

Excessive water in the mine is pumped continuously into Bowers Coulee directly from the pits, and is untreated.

Topsoil removal and stockpiling would have relatively insignificant effects on water quality. The exposed overburden would be subject to increased infiltration and percolation of solution downward for a short time. Runoff and erosion of topsoil stockpiles would increase the sediment load in surface and ground water for a short period of time.

Overburden removal may alter the chemical quality of water in the mine area. The mixed and overturned material could place undesirable material in contact with surface or ground water. This could result in chemical solutions contaminating ground water sources. The possibility of increased discharges down dip from the mine could eventually affect the surface water quality.

Excavation of the lignite could alter the chemical quality of the ground water, but the extent of its influence is unknown.

Reclamation activities would also affect water quality. The extent of the effect is thought to be slight depending on the material deposited in the overburden and the topsoil. Generally, the spoil would be mixed which could cause undesirable material to be placed in contact with ground water.

Topsoil would be placed over the graded spoils and treated for revegetation. If revegetation includes the application of herbicides, pesticides, and fertilizers, water quality would be changed as a function of the material added. The type and level of change would depend on the amount applied and its toxicity.

SOILS

Topsoil removal, stockpiling, and respreading would have a significant impact on soil depth. In some areas, five feet of soil material would be removed, stockpiled or respread; in others, where soils are shallower, less soil would be available for respreading. The result would be a more uniform depth of topsoil and subsoil on the reclaimed land than exists in the natural state. The soils that occur over federal coal generally have an effective rooting depth of 36 to over 60 inches. However, the Wabek soils are very sandy and gravelly in the subsoil and are consequently less desirable as a source of top dressing for graded mine spoils. Mixing with adjacent types may improve Wabek subsoil quality. The subsoil of the Wabek series probably has too many fines (silt and clay) to be useful as a source of sand or gravel without considerable screening and washing. This possibility could be further investigated, however.

For the most part, however, operations to remove, stockpile, or respread the soil would result in destruction of the soil material's present structure which would take many years to redevelop.

Soil nutrients would be impacted primarily by the mixing of organic matter and by the disruption and loss of soil micro and macro organisms, which are essential to the soil nutrient cycle.

The soils of the Velva area are forming in calcareous glacial till that may contain as much as 5 to 15% calcium carbonate and considerable calcium sulfate (gypsum). These are potential natural soil pollutants, or desirable soil constituents depending on the quantities. If placed on the surface in large concentrations soil fertility problems could result. Because the soils are to be removed in two separate lifts, this problem could be largely avoided by identifying these substances and controlling the depth of each lift. Erosion of the soil stockpiles and respread soils could be a problem until the piles are revegetated.

Grading the spoil piles would have no direct effect on eventual soil depth, structure, or nutrients. It would directly affect erosion from the spoil piles and the respread topsoil. This action should greatly decrease potential erosion simply by reducing the slopes.

Of all the activities, topsoiling will have the greatest impact on soil depth. The amount of topsoil actually returned to the leveled spoil piles will depend on the amount removed and stockpiled. Where available, up to five feet of soil would be removed in two lifts and either returned directly to the regraded spoils or stockpiled. In their natural state, some soils are deep and some are shallow. Respreading the soil materials would create more uniform soil depths by "averaging" the deep and shallow soils with the subsoil.

The operations necessary to remove, stockpile, and respread the soil materials would destroy the soil's natural structure thus decreasing water and air infiltration and root penetration. Soil nutrients would be primarily affected by the mixing of the soil materials during handling operations and by disruption of the nutrient cycle. The majority of the soil's organic matter is contained in the upper few inches of soil and would be mixed with whatever is removed during the first lift, (i.e., parts of the subsoils could be mixed with topsoil).

Initially, soil erosion would be higher than normal as these operations leave the soil bare and susceptible to increased water and wind erosion. Revegetation would produce ground cover, increase water infiltration and decrease soil susceptibility to erosion, thus it would have a high benefical impact on the area over federal coal and the mine area in general.

Revegetation would have an indirect effect on soil depth as roots, soil micro-organisms, and macro-organisms increase to their natural levels. Soil structure would be directly affected by revegetation because it would assist in re-establishing structure to the respread topsoil. Revegetation would directly affect soil nutrients in two ways: it will add organic matter to the soil as the plants die, decay and are incorporated; and it is assumed that fertilizer will be added during seeding, thus enhancing the soil nutrients.

VEGETATION

Due to the limited wetlands affected, any adverse impacts on aquatic plants would be of only minor importance. Once the topsoil is removed, the substrata for support of aquatic vascular plants and the plants would be destroyed. At any specific wetland site, there would be a complete loss of aquatic plants. The overburden removal operation would further this impact by destroying any existing wetland basin.

At present, wetlands are not being emphasized in the reclamation process, however, the regrading operation would represent a beneficial impact on aquatic vascular plants _if_ wetland basins were created. If wetland basins were created, the topsoiling operation would provide a fertile substrata for aquatic plants. Reseeding aquatic plants would help assure the establishment of wetlands (see Appendix 3, Page A3-5).

The impacts of mining and reclamation on phytoplankton would closely parallel those for aquatic vascular plants.

Soil removal would destroy lichens and mosses. Since they are not the dominant vegetation of the area, however, the overall impact is reduced. Overburden removal would change the overall physiographic aspect of the land and a further slight impact may occur on the lichens and mosses. The effect of reclamation on lichens and mosses is largely unknown. Lichens and mosses have not been considered for reclamation since they are not particularly useful as forage for the local domestic livestock and native wildlife. They might naturally reinvade a reclaimed area, but their pre-mining status probably would not be attained.

Topsoil removal would destroy the essential supporting substrata for grasses and forbs, as well as the plants. Excessive amounts of dust from mining activities may interfere with the plants normal physiological processes. Overburden removal would destroy topographic exposures, and affect the micro-climate, (surface temperatures, moisture accumulation, etc.) resulting in a detrimental impact on vegetation. The impact of overburden removal would not be as severe as that of topsoil removal and thus was considered of lesser importance. The reshaping operation would create a topography favorable for consistent range plant growth, thereby, having a beneficial impact on grasses and forbs. Topsoiling would provide an immediate plant growth medium, and seeding would greatly accelerate the revegetation process. These impacts could be realized immediately (within one growing season) after initiation. The emphasis on reclamation in this area appears to be toward grass and forb species, although the pre-mining mixture of grass and forb species is not apt to be restored.

During mining, shrubs would be impacted, in a similar manner as grasses and forbs. Since topography and exposure appear to be critical to shrubs at the Velva site, however, the overburden removal could have a greater adverse impact on shrubs, than on grasses and forbs. Most of the shrub complex occurs on steep slopes with relatively coarse soils and a favorable moisure regime (mesic sites). This soil-topography-moisture complex is critical to shrubs, and would not be duplicated. The replaced topsoil generally would be finer textured than the typical coarse soils of the steep slopes and may be a better growth medium for competing plant species (i.e., grasses and forbs). If shrubs are planted and cared for until they become established, the impact would be significantly beneficial. However, the pre-mining shrub complex would probably never be completely duplicated.

Broadleaf trees would be destroyed in the topsoil removal operation. Since broadleaf trees are typically found in mesic sites in this area, overburden removal could affect the drainage pattern, and therefore, these plants. This operation represents a slight additional impact on broadleaf trees. The regrading operation is not likely to create wetland basins or mesic exposures. The importance of this impact is undetermined. Topsoiling, if conducted along a mesic exposure or wetland basin (if present), is considered beneficial to broadleaf trees by accelerating the revegetation process. Since the reclamation emphasis is not generally aimed at broadleaf trees, they would probably not be re-established in their original sites.

ANIMALS

The removal of the topsoil would eliminate any opportunity for the existence of most significant aquatic habitat. Eliminating this habitat would remove the aquatic animals (i.e., muskrats, mink, raccoons, etc.). Overburden removal would change wetland basins and drainage patterns and further impact aquatic animals. Since little aquatic habitat exists on the proposed lease tract, the impact would not be significant. Reclamation would have a beneficial impact on aquatic animals if wetland complexes were created. The reclamation emphasis, however, has been away from wetlands, so the impact of reclamation on aquatic animals is expected to be insignificant. Wetland basins could be created in the regrading operation; an aquatic vegetation substrate could be replaced with the topsoil; and revegetation with aquatic plants could assure the existence of aquatic habitat. Any aquatic habitat created, however, would differ from the pre-mining condition, and many years would probably be required to establish a stable and diverse wetland (see Appendix 3, Page A3-5).

Topsoil removal would destroy terrestrial animal habitat. This would have an important adverse effect on terrestrial animals (deer, cattle, songbirds, grouse, bull snakes, etc.) because all cover and food are destroyed. Overburden removal would change land relief, and thereby, impact the animals by changing their macro-environment. Blasting and excavation would not have any permanent impact on terrestrial animals. After initial alarm responses, wildlife would not pay much attention to the mining noise or activities. Collisions between transient wildlife and coal haul trucks would be an adverse impact. This impact must be considered relatively unimportant, although it would continue for the life of the mine. Regrading of the spoils banks would create a favorable topography for topsoil replacement and vegetative growth, and therefore, is important to all major terrestrial animals. The topsoil replacement operation would be even more beneficial because it provides a plant growth substratum for revegetation. Soil invertebrates would be even more favorably impacted by topsoiling than are other terrestrial animals. The revegetation operation provides the habitat, cover, and food complex required by terrestrial animals.

Man, as an animal, is expected to be detrimentally impacted by the topsoil removal operation, because a food source (cropland or rangeland) would be lost. This impact would be slight, however, because of the small area involved. The safety hazard to man during all the mining and reclamation operations is important throughout the life of the mine. Reclamation should restore the surface for man's activities and, therefore, have a beneficial impact.

ECOLOGICAL PROCESSES

Topsoil removal would immediately destroy the site vegetation and cause plant and animal succession and community relationships to regress. This immediate environmental impact would be highly detrimental to the existing ecosystem. However, succession is a dynamic process and new vegetative establishment would soon start. Therefore, the long term detrimental impact would be of lesser importance. Overburden removal operation would change land relief and the potential climax vegetation. The impacts on food and community relationships would parallel those of succession. The other discrete operations of mining would not have any significant impact on these processes. Spoils grading would create a topography favorable for plant establishment. Topsoiling would further enhance potential vegetation re-establishment. Revegetation would establish a plant successional stage and provide a basis for animal habitat. For these reasons, revegetation would be beneficial and important. The impact rationale for food and community relationships in the reclamation stage would parallel those for succession. The exact conditions which created the present ELU's would not be duplicated after mining (see Appendix 3, Page A3-6). The new ELU's created in reclamation should eventually balance, functionally, with adjacent unmined ELU's. The overall long term impacts of this new balance are unknown.

CULTURAL RESOURCES

The primary impact of strip mining on cultural resources would be the destruction of archaeologic, paleontologic and historic sites if present. During the removal of topsoil and overburden operations, most structures, objects, ruins, art work, architectural works, burials, artifacts, and other evidences of paleontologic occurrence or human endeavor would be lost. The context in which these resources were originally deposited would be destroyed. This is essential in reconstructing the story behind the objects.

A secondary impact is related to increased population in the mining area. More people are likely to collect artifacts and fossils from the area and destroy historic structures. Relic hunters and vandals are a threat to cultural resources.

The magnitude of the mining impact is unknown and could be determined only after an intensive cultural resource survey.

AESTHETICS

The following analysis of impacts on visual resources are based on procedures contained in BLM Manual 6320. In general, these procedures involve measuring the contrast on the four landscape elements (line, form, color, and texture) created by the proposed action.

Line is the strongest landscape element in the rating area. It is expressed by roads; power and telephone lines; fences; and field boundaries. Natural expressions of this element include the drainages and associated vegetation patterns. Form, line, and color elements are all weak to practically non-existent. The rating area contains level to rolling topography. An artificial form element has been created in and adjacent to the proposed lease area by unreclaimed spoils. Texture and color are generally expressed by the vegetative patterns. Both are very weak.

The ease of detecting contrast varies according to the following scale: 4 (form); 3 (line); 2 (color); and 1 (texture). Assigning values to indicated degree of contrast (3 for strong, 2 for moderate, and 1 for weak) permits the establishment of a direct multiplier for indicating the strength of the contrast.

The following tables contain the contrast ratings for the period of active mining (Table 3-1) and following reclamation (Table 3-2). A score for each feature of 1-10 indicates the contrast can be seen, but does not attract attention (low impact); 11-20 attracts attention (moderate impact); 21-30 demands attention (high impact).

Table 3-1

VISUAL CONTRAST RATING DURING MINING

	Element		Contrast		Score	Maximum Possible Score
Land Surface Features	Form-4	x	Moderate-2	=	8	12
	Line-3	x	None-0	=	0	9
	Color-2	x	Weak-1	=	2	6
	Texture-1	x	None-0	=	0	3
			Subtotal		10	30
Vegetation Features	Form-4	x	None-0	=	0	12
	Line-3	x	Weak-1	=	3	9
	Color-2	x	Weak-1	=	2	6
	Texture-1	x	Weak-1	=	1	3
			Subtotal		6	30
Structure Features (Roads, Fences, etc.)	Form-4	x	None-0	=	0	12
	Line-3	x	Weak-1	=	3	9
	Color-2	x	None-0	=	0	6
	Texture-1	x	None-0	=	0	3
			Subtotal		3	30
			TOTAL		19	90

The summary rating indicates that mining would have a low impact on aesthetics. The greatest contrast would result from a change in the form element. Additional "form" would be created by spoil piles. It should be noted that the form contrast would probably rate high if this was a new mine start. The other elements resulting from mining would essentially duplicate existing landscape elements.

Table 3-2

VISUAL CONTRAST RATING AFTER RECLAMATION

	Elements		Contrast		Score	Maximum Possible Score
Land Surface Features	Form-4	x	Weak-1	=	4	12
	Line-3	x	None-0	=	0	9
	Color-2	x	None-0	=	0	6
	Texture-1	x	None-0	=	0	3
			Subtotal		4	30
Vegetation Features	Form-4	x	None-0	=	4	12
	Line-3	x	None-0	=	0	9
	Color-2	x	Weak-1	=	2	6
	Texture-1	x	None-0	=	0	3
			Subtotal		6	30
Structure Features	Form-4	x	None-0	=	0	12
	Line-3	x	Weak-1	=	3	9
	Color-2	x	None-0	=	0	6
	Texture-1	x	None-0	=	0	3
			Subtotal		3	30
			TOTAL		13	90

The visual impact after successful reclamation would be very low. A small change in form would result from a slightly different topography and vegetative type. There would also be a slight change in line and color due to altered vegetative types and structure (fences, roads, etc.) locations.

RECREATION

The direct site-specific impacts on recreation associated with the proposed action would be very low. The area involved (120 acres) would be lost to recreation use (primarily hunting opportunities) during the mining and reclamation period. The on-going adjacent mining activities have already reduced recreation values on the proposed lease area.

Off site or indirect impacts on recreation would be negligible. No increase in employment is anticipated, therefore, no new demands would be created.

SOCIO-ECONOMIC CONDITIONS

Approval of the lease application would affect the area's current socio-economic structure only in that it will provide about three additional years of mining and employment for 37 people at the present rate of coal extraction.

The success of reclamation efforts may determine the usefulness of the mined land for future economic activities such as farming or grazing. The impacts, whether favorable or adverse, may be significant to local people.

LAND USE

Suitability

The U. S. Geological Survey has determined that these lands contain coal.

The rolling topography and soil types would facilitate topsoil removal and stockpiling.

Overburden removal would be limited by the tendency of the unconsolidated material to slough. This would limit the depth to which mining can safely take place.

Excavation, and loading of the coal would be easily accomplished. The coal seam is soft, fractures easily, and is approximately 14' thick.

Transportation, delivery, and crushing would be easily accomplished. All the needed facilities are constructed and in good repair.

The lands would be highly suitable for reclamation. Regrading the land to approximately its original contour would be easily accomplished. The topsoil would provide a highly suitable growth medium on the graded spoils. Reseeding would restore a vegetative cover. The topsoil quality and quantity is suitable for these purposes.

Compatability

The land in this area has two demands placed on it, agriculture and mining. Resources for both demands are available as are the services needed for each.

Leasing the land would be compatable with mining. The tract adjoins an existing operational mine and along the path of the logical mining sequence.

Mining would be incompatable with agriculture, because it removes the land from the agriculture base until reclaimed. The removal of the topsoil would eliminate the land from any use except mining.

Reclamation is compatable with all land uses.

The present topography would be drastically altered during mining. Regrading the spoil piles would establish new surface drainages and create a rolling topography which would be suitable for agricultural practices. Topsoiling the area would replace the growth medium and help return the area to its original productivity.

CHAPTER 4

MITIGATING OR ENHANCING MEASURES

APPLICANT'S (OR BLM'S) COMMITMENTS

If the project proceeds as proposed, all existing federal and state laws and regulations pertaining to coal strip mining and its associated effects on the environment would apply. There are also a number of standard stipulations (minimum mitigating measures) in the current federal coal lease form (see Chapter 1). The following minimum standards are general and relevant to this analysis:

Topography

1. Disposition of any final highwall shall be determined after consultation with the U. S. Geological Survey, B.L.M., North Dakota State Public Service Commission, and the mining company.
2. All spoils must be graded to the approximate original land topography unless a different contour is decided upon by all involved parties.

Water

3. Dams, ditches, dikes, and canals used for surface water control in and around the mining operation shall be constructed in accordance with approved engineering practices and located so as to do the least amount of environmental damage. Soil material shall be placed on all dams and dikes following construction. These and all areas denuded during construction of water control structures shall be seeded after placement of soil material.

4. All drainage waters discharged into natural drainages must meet federal and state water quality standards. If necessary, they shall be impounded for chemical and sediment treatment.

5. Flowing springs, wells, and reservoirs which are eliminated by mining shall be replaced with suitable alternative water sources.

Soils

6. Toxic material (former overburden, spoils) which could jeopardize reclamation shall be buried at a minimum depth of five feet below the surface.

7. Soil material to be used in reclamation shall be removed and stockpiled, or placed directly on regraded spoils. Soil material which will be stockpiled for more than one year shall be seeded. Additional protective measures, such as orientation of stockpiles and reduced stockpile slopes, shall be taken to prevent soil loss from wind and water erosion.

Vegetation

8. Seeding and planting composition, rates, and other revegetation criteria will be reviewed at the time of seeding.

9. Seeding will be done as instructed until it has been determined to be successful by the BLM and the North Dakota State Public Service Commission.

Animals

10. The active mining areas shall be posted, fenced, or otherwise protected where necessary to minimize injury to people, domestic livestock, and wildlife.

11. Drill holes shall be protected at all times so as to prevent injury to people, domestic livestock, and wildlife. They shall be permanently sealed when the need no longer exists.

Cultural Resources

12. Any cultural resource mitigating measures must be preceded by an intensive cultural resource survey to locate sites in the lease application area. After the resources are located and tested, the archaeologists in charge of the survey and BLM cultural resource personnel would evaluate any sites found. The criteria for evaluation of sites are those established for considering the resource's potential for placement on the National Register of Historic Places (Appendix 4). Any sites considered to have National Register potential would be referred to the North Dakota State Historic Preservation Officer. Potential National Register quality sites would then be forwarded to the National Park Service for placement on the Register if qualified.

If any cultural resource in the lease application area is found eligible for inclusion on the National Register, it must be referred to the Advisory Council on Historic Preservation for comment prior to any federal decision affecting the resource in compliance with the National Historic Preservation Act of 1966 and Executive Order 11593. This comment must be considered in the final decision regarding the lease application.

From the interchange among federal agencies, the State Historic Preservation Officer and, if warranted, the Advisory Council on

Historic Preservation, decisions would be made regarding any cultural resources found in the survey. Measures to take into account, avoid, or mitigate the loss of archaeological, paleontologic, and historic information would be formulated as stipulations to the lease, if approved.

13. If an archaeological, paleontological, or historical site is discovered during mining, operations shall immediately cease and the BLM District Manager and other appropriate authorities shall be notified. A reasonable time will be allowed for evaluation and/or removal (see Appendix 4).

Aesthetic

14. Surface buildings, supporting facilities, haul roads, and other structures which have served their purpose shall be removed and their sites graded and revegetated.

Human Values-Regulatory

15. To prevent or abate environmental pollution, any excessive amounts of pollutants will be prevented from reaching the air, water, or land resources, including surface water sources and ground water aquifers (subsurface geologic strata through which ground water moves). "Excessive amounts" of pollutants means any amount which exceeds the maximum amount permitted by the Federal Water Pollution Control Administration, National Air Pollution Control Administration, and by the appropriate agency of the State of North Dakota.

16. The lessee will be required to comply with all state laws and regulations concerning coal mining, including laws and regulations pertaining to the protection and reclamation of surface resources,

and to the protection of the land, air, and water environment, where applicable.

17. Haul roads shall be constructed to the minimum width necessary for efficient and safe operations. Haul roads must have adequate drainage and be constructed consistent with good watershed practices. Haul roads shall be sprinkled with water when necessary to reduce air pollution from dust. Haul roads shall be located so as not to interfere with proper shaping of spoil piles, and they may double as access roads.

18. All operations shall be conducted so as to avoid range fires and spontaneous combustion. Open burning of carbonaceous materials shall be in accordance with suitable practices for fire prevention and control. The mining company shall take immediate steps to extinguish any fires in piles of coal waste or slack, or in-place coal.

19. All existing improvements, including but not limited to gates, cattleguards, roads, trails, pipelines, bridges, public land survey monuments, and water development and control structures, shall be replaced, restored, or appropriately compensated for in the event they are damaged or destroyed by company operations.

Land Use

20. Where an excavation is to be left as a permanent water impoundment, accesses appropriate to its use should be provided.

ADDITIONAL POSSIBLE MITIGATING OR ENHANCING MEASURES

The following is a list of measures that may help to reduce or enhance the impacts identified in the preceding analysis. They are made without regard to the practicality of the actions. In some cases they may not be applicable, but are brought out for consideration only.

Air Quality

1. Keeping all mining equipment properly maintained would reduce the level of exhaust emissions. Exhaust emissions should be checked with each periodic maintenance of mining equipment.
2. Construction of roads and mine facilities could be limited to the more moist seasons of the year. This would reduce the level of dust that would be expected from these operations.
3. The areas in which permanent roads and facility construction is taking place could be watered, or oiled, to reduce the amount of expected particulate matter.

Topography

4. Undulating terrain could be developed during the regrading process. This would help provide some of the necessary ecological requirements of the endemic wildlife species.

Water

5. During mining, soil erosion and sediment load could be reduced by surface manipulation and installation of water control devices such as settling ponds, water bars, check dams, and culverts.
6. Excess mine water could be pumped into a settling pond and its rate of release controlled. This would reduce sediment load, soil, and stream bank erosion.

7. Prevent buried toxic and other undesirable materials from contaminating ground water or infiltrating surface water.

8. Properly placed energy dispersion structures would reduce soil erosion, sediment load, and mitigate impacts on aquatic vegetation and animals.

9. Surface manipulation of topsoiled areas (such as gouging, dozer basins, and deep chiseling) would increase water interception, infiltration, and retention capacity. This technique would benefit the hydrologic cycle by improving the moisture content available for vegetation and reduce wind and water erosion.

10. Monitoring water courses would help maintain water quality in and around the mining site by detecting potential or existing water problems. This would reduce impacts from increased sediment load, decreased dissolved oxygen, increased dissolved solids, nutrients, chemicals, heavy metals, changes in pH, and water temperatures. Monitoring should be started prior to new mining and continue into the period following reclamation, in order to realize maximum benefits.

11. Since impacts on ground water aquifers are largely unknown, hydrologic investigations should be initiated to determine the impacts of mining on the aquifers.

Soil

12. The effects of road construction on soil depth could be reduced by stockpiling the topsoil removed and replacing it following closure of the road.

13. Soil erosion and sediment load could be reduced by maintaining minimum slopes on regraded spoil piles.

14. Avoid mixing alkaline or calcareous materials in the topsoil or subsoil removed. This would reduce the expected impacts on soil nutrient properties.

15. Soil pollutant impacts could be reduced by placing alkaline, calcareous, or other toxic material well below the surface.

16. Overburden with favorable soil-like properties could be used as subsoil or in place of second lift material. This would reduce impacts on soil depth, soil structure, hydrologic cycle, and deep rooted terrestrial plant growth.

17. Surface manipulation of regraded spoils prior to topsoiling would reduce the chance of topsoil slippage and improve infiltration rates.

18. During topsoil replacement, the second lift (mainly "B" horizon material) should be laid down first and the first lift (or "A" horizon material) spread over it. This would reduce impacts on soil structure and nutrients.

19. Once topsoiling has been completed, any operation which would tend to mix excessive amounts of topsoil with the underlying regraded spoils should be avoided.

20. Minimum tillage on reclaimed areas would reduce impacts on soil structure.

21. The use of fertilizers to establish an effective vegetative cover should follow guidelines established through soil testing. Rapid

establishment of a vegetative cover would reduce wind and water erosion and aid the re-establishment of soil nutrients and soil structure.

22. Mulching new seedings in reclaimed areas would provide a more favorable growth environment, reduce evaporation rates, and supply valuable organic matter to the soil. This would facilitate revegetation and reduce wind and water erosion.
23. Mulching road cut seedings would reduce soil erosion, sediment load, and facilitate revegetation.
24. Revegetating with both shallow and deep rooted plant species would improve the soil structure.
25. Herbicides and pesticides should be used with extreme caution and only when absolutely necessary to assure reclamation success. This would keep soil, water, and forage free of pollutants.

Vegetation

26. The site should be surveyed for officially endangered plants and animals.
27. Significant aquatic and riparian habitat should be avoided during mining when reasonably possible. All aquatic habitat lost during mining operation should be replaced during reclamation. New permanent deep water ponds could be developed during reclamation. Created wetlands should be seeded with aquatic plants. Properly designed ponds would create a fisheries, aquatic wildlife habitat and diversify existing wildlife conditions. It would enhance recreation by providing new opportunities.

28. The construction of shallow impoundments (dams in natural drainage-basin areas, including reconstructed or reshaped drainage ways) would enhance aquatic habitat. Such impoundments present seasonal, semipermanent or permanent wetland characteristics. A strip of herbaceous cover at least 35 feet wide should surround such impoundments, and be protected from livestock grazing by fencing.

29. Studies regarding wetland habitat replacement would be a significant enhancing measure not only for this mine, but for other mines throughout the area. Cooperation between the mining company and the U. S. Fish & Wildlife Service with regard to funding and research objectives and procedures is a viable consideration.

30. Diverse, native, terrestrial plant species (grasses, forbs, shrubs, and trees) should be replanted in the appropriate sites as soon as suitable conditions exist. This replanting could be accomplished, in some instances, by moving "clumps" of native species with a "tree spade". This measure would reduce the time the area is without vegetation and minimize aesthetic impacts.

31. During reclamation, trees and shrubs should be transplanted to areas where they presently exist or where suitable sites occur. This would mitigate aesthetic impacts and provide food and cover for wildlife. Woody plants could be a combination of clump plantings (¼ to 1 acre), block plantings (4 to 10 acres), ponded water border plantings, two row shrub travel lane plantings, and odd area woody plantings. Native woodland habitat should be considered for replacement on a 2 to 1 basis.

    Between-the-row cultivation should be considered for tree plantings which would be developed on relatively level sites.

Where soil erosion is a definite problem, native grass should be planted on the site prior to tree planting or a herbaceous seed mixture should be seeded between the planted tree rows.

32. During reclamation, supplemental irrigation could be used to aid revegetation.

33. No grazing should be allowed on reclamation plantings until the vegetation is well established and can be expected to withstand grazing pressure. This would promote successful vegetation establishment.

34. On those areas to be grazed after reclamation is completed, carefully monitored management procedures should be instituted. This action would assure permanent reclamation success through vegetation establishment.

Ecological Processes

35. During reclamation, various vegetation life forms should be planted in a manner which provides for maximum diversity and interspersion.

Aesthetics

36. The boundary of the mined area could be "varied" or "feathered" during reclamation. This would reduce the contrast between mined and unmined areas and partially mitigate the impact on aesthetic values.

Socio-Economic

37. If the lease applicant complies with the mitigating and enhancing measures recommended in other sections of this chapter, potential socio-economic impacts will also be minimized. Proper reclamation

should leave the land with an acceptable level of productivity. Successful reclamation should also promote positive public sentiment toward the mining effort.

A measure which is not enforceable, but which may promote positive public attitudes toward the mining industry and mitigate future economic impacts involves planning. Governmental planning should be taking place on all levels to mitigate fiscal and social impacts of the future decline in mining operations. As coal is depleted in the area, government and the public should be prepared to deal with a probable decline in jobs, population, and revenues.

Human Values-Regulatory

38. Although not a true "mitigating" measure, but rather, an administrative option, the regulatory authority of the BLM leasing officials to selectively deny unsuitable lease tracts, or portions thereof, (i.e., the on-site existence of critical or sensitive vegetative components, or excessively steep slopes, etc.) functions as a "defacto" mitigating measure.

Land Use

39. Reclamation for agricultural and/or grazing purposes would insure compatibility with adjoining land uses.

CHAPTER 5

RESIDUAL ADVERSE IMPACTS

Assuming that the recommended mitigating and enhancing measures are applied, there would still be impacts which cannot be avoided or totally mitigated. This Chapter discusses those impacts.

CLIMATE AND AIR QUALITY

The removal of vegetation would affect the air temperatures and air movement patterns close to the surface, although there would be no changes in the regional climate. The microclimate would be influenced until advanced vegetation is re-established. Fugitive dust levels would increase during all mining and reclamation stages. There would also be an insignificant increase in exhaust emissions from mining equipment.

GEOLOGY

Impacts on the geology component, as described in Chapter 3, cannot be mitigated, and therefore, would carry over as residual adverse impacts. The integrity of the geologic strata comprising the overburden and coal bed, in addition to the paleontological values enclosed within them, would be destroyed. The non-renewable lignite could not be replaced.

TOPOGRAPHY

The impacts on the topography component would not be completely mitigated during reclamation because it would be impossible to reclaim the mined lands to their exact pre-mining condition. On the whole, the reclaimed topography could be expected to consist of lower sloped landforms.

WATER

The water component of the environment at the Velva mine would be changed in spite of mitigating measures. The expected impacts on the water component are either of low significance, or unknown.

Water quality variables, such as sediment load, water-borne nutrients, dissolved solids, pH, and toxic materials may be increased in surface and ground waters because of increased permeability and porosity in regraded spoil and topsoil materials. Blasting of overburden and coal would introduce foreign chemicals, such as nitrates.

SOILS

Even if all recommended mitigating measures are applied, there would still be some negative impacts on some soil properties (i.e., soil depth will be altered considerably). Some soil loss could be expected during handling operations. Soil depth following reclamation would probably be much more uniform than it was previous to removal. Unavoidable mixing of soil textures (i.e., sandy soils with clayey soils) would occur. This would be desirable in some cases and detrimental in others. Soil structure would be virtually destroyed during soil handling operations. Some mixing of topsoil and its organic matter with subsoil and disruption of the soils natural nutrient cycle would occur. Soil micro and macro organism activity would also be disrupted. Some mixing of calcareous and/or gypsic materials with the topsoil would probably be unavoidable. Increased wind and water erosion could be expected until the mined area is vegetated and stablized.

VEGETATION

The exact circumstances (i.e., range fires, floods, grazing, erosion, physiographic positioning, regional and microclimate, etc.) which led to the development of the present vegetation complex on the proposed lease tract would probably not be sequentially repeated. As a result, the pre-mining vegetation complex would not be "restored" following mining. Agricultural grasses and forbs have been strongly emphasized in past re-vegetation (reclamation) efforts. Unless shrubs and broadleaf trees are also replaced, an adverse residual impact on these environmental sub-components would be realized. The same rationale and circumstance pertains to aquatic (wetland) vegetation complexes.

ANIMALS

Wildlife residual impacts would closely parallel those of vegetation. The endemic wildlife species would return to the mined area only when the habitat is replaced.

ECOLOGICAL PROCESSES

Succession is a naturally continuing process which constantly proceeds toward climax. It would take many years for the vegetation complex to reach climax following mining. This "lag" period (seral stages) would be a residual impact. The changed soil character and topography of the mined area would also dictate a "new" local climax at the mine site. The food and community relationships could be expected to exhibit a residual impact which parallels and reflects the vegetation communities re-established on the mine site.

CULTURAL RESOURCES

The cultural resource survey and mitigation process described in Chapter 4 would minimize the loss of cultural values threatened by mining. No matter how intensive, some sites may not be located during an archaeological survey. Those sites which are not discovered during the preliminary survey could be lost, which constitutes a residual adverse mining impact.

Additional residual impacts may be apparent after the cultural resource survey and evaluation are completed.

AESTHETICS

There would be a slight increase in noise levels and visual disturbances during the time required to mine and reclaim the proposed lease area. They would occur on adjoining areas regardless of whether the federal coal is leased or not.

The main impact following reclamation would be a slight change in land form. The general topography would be reduced to a gentler (more rolling and undulating) form than presently exists.

RECREATION

The 120 acres in the proposed lease would be lost to recreation opportunities (primarily hunting) during the mining period. These losses would occur even if the lease is not granted because of the adjacent on-going mine operations.

SOCIO-ECONOMIC CONDITIONS

The economic suitability of the land after mining would depend on the success of the reclamation effort. If this effort is not successful, the land may not be suitable for future farming or grazing. Failures of reclamation would constitute an adverse residual socio-economic impact.

LAND USE

Once the land has been properly rehabilitated, there should be no residual adverse impacts.

CHAPTER 6

SHORT TERM USES VS. LONG TERM PRODUCTIVITY

The short term is that period during which the substantive part of the proposed action takes place. In the case of the proposed lease, this period would begin with the mining operation and end with reclamation in approximately 1988. The long term is that period beyond 1988 when impacts may still be occurring.

CLIMATE AND AIR QUALITY

The short term use of the environment for mining would affect only the long term microclimate of the area. The microclimate will be changed because of changes in the topography. These microclimatic changes would have only insignificant long term effects on productivity.

Short term use of the area would affect long term air quality.

GEOLOGY

The long term impacts which would affect productivity of the land are somewhat speculative in nature, but with the high degree of reclamation technology available today, it is reasonable to assume that the long term productivity of the land in the proposed lease area could equal pre-mining conditions.

TOPOGRAPHY

The land may be more adaptable to agricultural uses after mining and reclamation than it was before, since the reclaimed landscape would consist of lower or more gentle-sloped landforms. The mining of lignite from the proposed lease area may lead to an increased long term productivity for agricultural purposes.

WATER

The water component of the environment may be residually impacted, but probably only to a negligible degree in terms of the long term productivity of the proposed lease area.

SOILS

The short term use of the environment is expected to change the long term productivity of the soils. Even after successful reclamation, it would take many years for soil structure to reform. Movement and mixing of soils would also change the composition of soils. Ultimately structure would reform, but the composition would be new. The ultimate productivity of the soil for the long term may become similar to that preceding the mining, but that would take many years.

VEGETATION

There is no short term use for vegetation within the functional scope of a strip mine. The long term productivity of vegetation after mining is largely unknown. Since most reclamation revegetation efforts, past and present, have emphasized artificially sustained agricultural plants, it seems reasonable that cropland sites would approach, or surpass, their original pre-mining productivity. However, the extremely complex and ecologically adjusted native rangeland areas would probably fail to regain their pre-mining productivity. If the original productivity of these native range sites is achieved, it undoubtedly would take many years and be the result of a definite emphasis in reclamation effort.

ANIMALS

As with vegetation, there is no short term use for wildlife within the scope of strip mine activities. If a diversity of wildlife habitat is replaced in the reclamation process, the long term productivity of wildlife populations could feasibly be attained at, or above, pre-mining levels. With the present reclamation emphasis, however, it is unlikely that pre-mining wildlife productivity would be achieved.

ECOLOGICAL PROCESSES

Ecological processes are an intangible function, rather than a tangible resource. For this reason, short term use and long term productivity are not relevant to these functions in the same manner as for palpable resources.

CULTURAL RESOURCES

If destroyed or altered, the non-renewable cultural resources would be lost forever.

AESTHETICS

Short term use of the area for mining will result in a slight lowering of long term aesthetic values.

RECREATION

The short term use of the area for mining would not affect long term recreation productivity if successfully reclaimed.

SOCIO-ECONOMIC CONDITIONS

Between the time that the 65 acres of federal coal is mined and the completion of reclamation, the land will not be suitable for economic activities other than mining. If reclamation is successful, grazing or farming at pre-mining levels may be resumed by 1988, or 1989.

LAND USE

With proper reclamation, the long term productivity for tangible land uses (primarily agriculture) should reach pre-mining levels.

CHAPTER 7

IRREVERSIBLE ACTIONS AND IRRETRIEVABLE RESOURCE COMMITMENTS

Irreversible actions are those actions or processes which would occur as a result of implementation of the proposed action (proposed lease). Irretrievable resource commitments are those commitments or losses which would occur as a result of the actions.

CLIMATE AND AIR QUALITY

None of the actions in the proposed lease would result in the irretrievable commitment of any resources in this component.

GEOLOGY

Strip mining of lignite on the proposed lease area is an irreversible action and an irretrievable commitment of the resource. Once the lignite is mined, this non-renewable natural resource would be lost forever.

TOPOGRAPHY

Irreversible changes and irretrievable losses would be expected to occur to the topography component of the environment irrespective of the amount of energy and money expended to reclaim the mined area. It would be nearly impossible to re-establish the original (pre-mining) topography.

WATER

The Coteau coal bed serves as the source of shallow water wells which are used mainly for livestock purposes in the mine area. Mining this coal bed would destroy a portion of this aquifer system.

SOILS

The existing soil would be destroyed by mining and reclamation activities. However, it would be replaced by material that will develop its own unique set of properties, qualities, and characteristics.

VEGETATION

Strip mining is an irreversible action which would lead to the irretrievable commitment of the existing mine site vegetation. The reclamation process would create a secondary effect by replacing substitute vegetation and retrieving part of the functional aspect of the pre-mining vegetation complex. Future on-site vegetation use options may, or may not, be foreclosed by the strip mine activities, depending on the emphasis of reclamation.

ANIMALS

Regarding irreversible actions and irretrievable commitments of resources, the impacts and rationale of strip mining on wildlife are identical to those of vegetation.

ECOLOGICAL PROCESSES

In regard to succession (which is a continuous process), strip mining must be considered a revocable action. As mining activities change the existing land uses, successional processes would be set back, but not completely destroyed. Food and community relationships are commited in the same manner as succession. The reclamation emphasis and ultimate land use patterns would strongly influence the progression of these ecological functions.

CULTURAL RESOURCES

If the lease application is approved, the removal of topsoil and overburden would become irreversible actions which may cause the irretrievable destruction of any cultural resources in the area. Even if information is extracted from the resource by scientific techniques, the sites would be irretrievably lost. Valuable anthropological information may be gained in the mitigation process, but the cultural resource itself would be altered or destroyed.

AESTHETICS

There would be a slight change in land form and vegetative patterns after mining and reclamation. This irreversible action would slightly reduce aesthetic values.

RECREATION

If reclamation efforts are successful, there would not be any irreversible or irretrievable commitment of recreation resources beyond the temporary loss of use opportunities during mining and reclamation.

SOCIO-ECONOMIC CONDITIONS

The approval of the lease application would precipitate the series of mining operations outlined in Chapter 1. These operations would become irreversible actions, but would not cause irretrievable resource commitments in the socio-economic sector. Changes in lifestyles and public attitudes would not be altered significantly by the proposed lease because it would occur in an area already experiencing coal development.

LAND USE

Proper reclamation should retrieve many of the premining characteristics of the subject lands. Regardless of reclamation emphasis, however, complete restoration is very unlikely. Those values permanently lost represent an irretrievable commitment to land use.

CHAPTER 8

ALTERNATIVES TO THE PROPOSED ACTION

The definitive action analyzed by the BLM on a minerals lease application (i.e., coal) is to lease, or not lease. The BLM does have the option of selectively denying the lease of certain tracts, or portions thereof, of a lease application for documented reasons such as excessive environmental degradation. In the analysis of the entire proposed mineral lease, the impacts that would warrant selective denial of certain tracts, or portions thereof, will surface in the study. In this manner, the environmental consequences of the proposed action, and the public response to these consequences, are fully set forth before the agency official responsible for the decision.

NO ACTION

Description of the Alternative

The "no action" alternative to the applicant's coal lease request is to deny the lease application. This means that the coal would remain in federal ownership, and the applicant would have to rely on private coal reserves to meet contractual commitments. Due to equipment limitations and mining conditions (i.e., the size of equipment prohibits deep mining, and the highwall collapses easily), the applicant is restricted to locations that can be economically and safely mined. Most of the reserves that can be mined with the present equipment and existing conditions have already been mined. Few identified reserves remain that can meet the applicant's needs outside of the federal coal. It is a real possibility that, without federal coal, the mine would be forced to close within several years.

In the mean time, mining would continue on the remaining private reserves. The applicant would be required to mine around federal coal. This alternative would not mean that mining activities such as roads and spoils could not be placed over federal coal. The BLM has no authority to regulate these activities on privately owned surface. The BLM is responsible for leasing the coal and insuring the leased area is reclaimed. If the federal coal tract remains unleased the North Dakota Public Service Commission is the only agency that has the authority to regulate these activities on the private surface.

Environmental Impacts

With non-lease of the federal coal, mining would continue at least for several years. Most of the impacts of mining would continue and would be similar to those discussed in Chapter 3. Only those impacts that differ from those identified with the proposed action will be discussed here.

Non-lease of the federal coal would impact the socio-economic component of the environment. It would result in the loss of the coal for the foreseeable future as an economic value. The people of the United States and State of North Dakota would realize no return from lease revenue and royalties. It would result in the early closure of the Velva mine and force those working there to seek other employment locally, or move to new locations. This would cause a reduced cash flow in the local area, but would not be particularly significant. Early closure of the mine would force the power plant at Voltaire and other energy consumers using Velva coal to seek alternative sources of fuel. This would result in higher costs to energy consumers, and could mean conversion to other types of energy for some users.

Land use would also be impacted by non-lease of federal coal. This alternative would leave a tract of minable coal along the edge of an already mined area. It would serve as an impediment to a logical mining and reclamation sequence, and increase the cost of both processes. It would be very costly to mine the limited federal coal after the adjacent coal has been mined and the area reclaimed. As a consequence, if unmined, the coal would be lost for the foreseeable future.

Mitigating or Enhancing Measures

There have been no measures identified that would apply to the alternative beyond those previously listed in Chapter 4.

Residual Adverse Impacts

The mine would be required to close at an earlier date than planned.

Those employed would be forced to seek other types of employment locally or move.

The local cash flow would be reduced.

The State of North Dakota and the United States would receive no royalties or lease money.

The federal coal would be lost as a resource for the foreseeable future.

The unit cost of reclamation and mining would increase.

The energy consumers supplied by the mine would have to find alternative sources of supply.

Short Term Uses vs. Long Term Productivity

The short term is the remaining length of the mining operation. The long term is that period beyond the life of the mine. The decision to not lease the federal coal would not affect the short term and would maintain the long term productivity of the tract for its current uses.

Irreversible Action and Irretrievable Resource Commitments

Because of the economics involved, the no action alternative would essentially commit the federal coal to nonuse for the foreseeable future.

CHAPTER 9

CONSULTATION AND COORDINATION

The following persons and organizations were contacted during the preparation of this environmental analysis record. Most of the information was used in the preparation of Chapters 1 and 2.

1. Dr. William Barker - North Dakota State University, Fargo, North Dakota.
2. Dr. Paul Kannowski - Institute for Ecological Studies, University of North Dakota, Grand Forks, North Dakota.
3. Robert Morgan - North Dakota Game and Fish Department, Bismarck, North Dakota.
4. Refuge Headquarters, U. S. Fish and Wildlife Service - Audobon National Wildlife Refuge, Coleharbor, North Dakota.
5. Area Office, U. S. Fish and Wildlife Service - Bismarck, North Dakota.
6. Nick Franke - Research Archaeologist, State Historical Society of North Dakota, Bismarck, North Dakota.
7. Dee Galt - Soil Conservation Service, State Office, Bismarck, North Dakota.
8. Soil Conservation Service - 408 20th Avenue, S.W., Minot, North Dakota.
9. Richard Huschka, Environmental Engineer - Consolidation Coal Company.
10. Dave Ripley, Ground Water Hydrologist; Dave Sprynczynatyk, Hydrologic Engineer - North Dakota State Water Commission.

11. Dan Kelner, Soil Conservationist - Soil Conservation Service, Velva, North Dakota.

CHAPTER 10

INTENSITY OF PUBLIC INTEREST

The intensity of public interest (either pro or con) in the subject federal coal lease is largely unknown at this time. If past BLM experience with similar coal leases in this area can be taken as an indication of present sentiment, the expected public response is predicted to be widely diversified and directed primarily at the issue of coal development, rather than at the lease of a specific tract of federal coal.

The response comments to the draft EAR document helped establish a prevalent trend regarding the intensity and direction of the existing public sentiment and concern over the proposed federal coal lease. Comments were received from approximately 16% of those entities solicited (see Appendix 6). The majority of comments and responses received came from other governmental agencies. Several items of concern were identified, but generally, the draft EAR document appeared to be relatively well received by those responding.

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APPENDIX 2

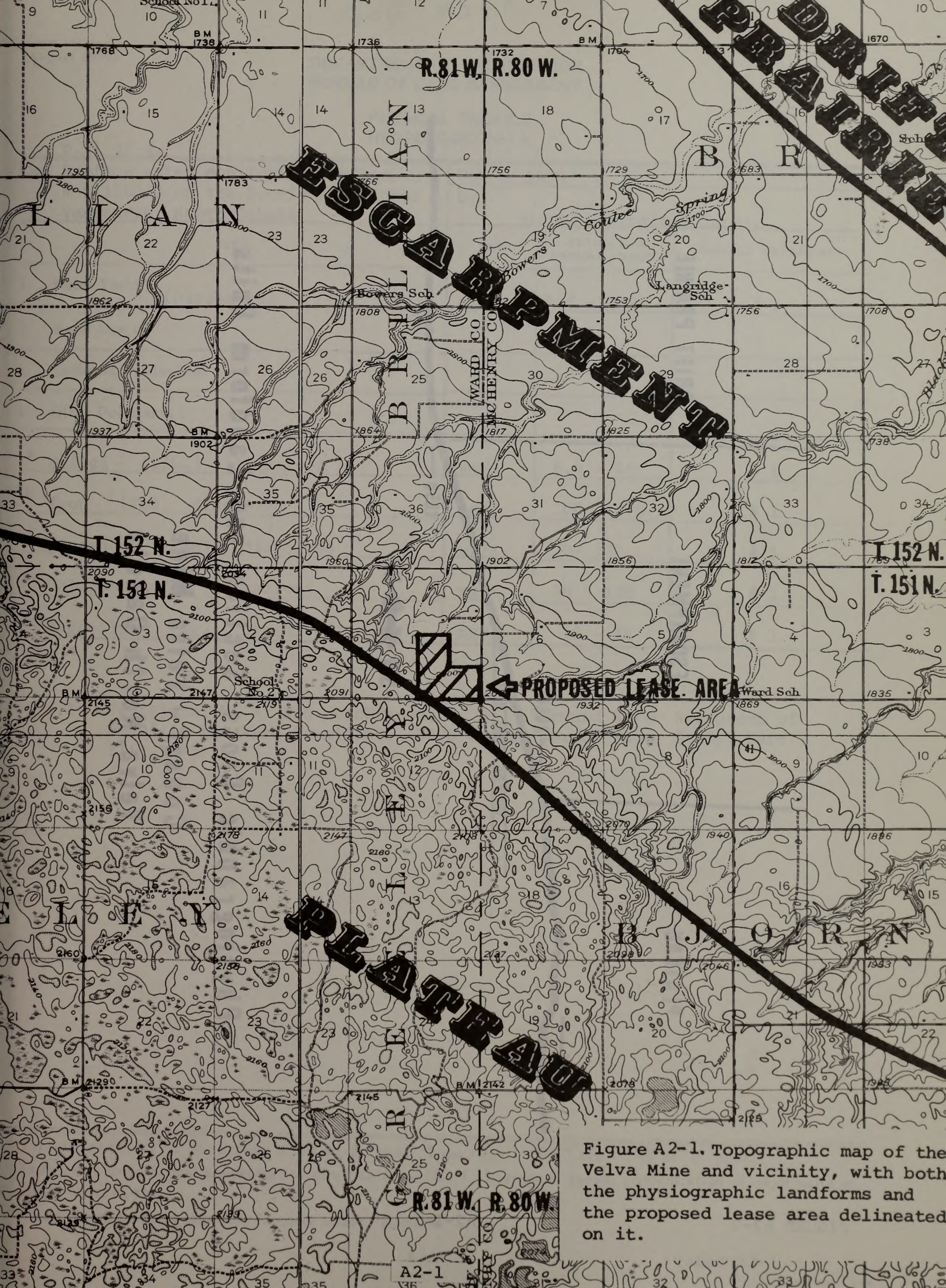
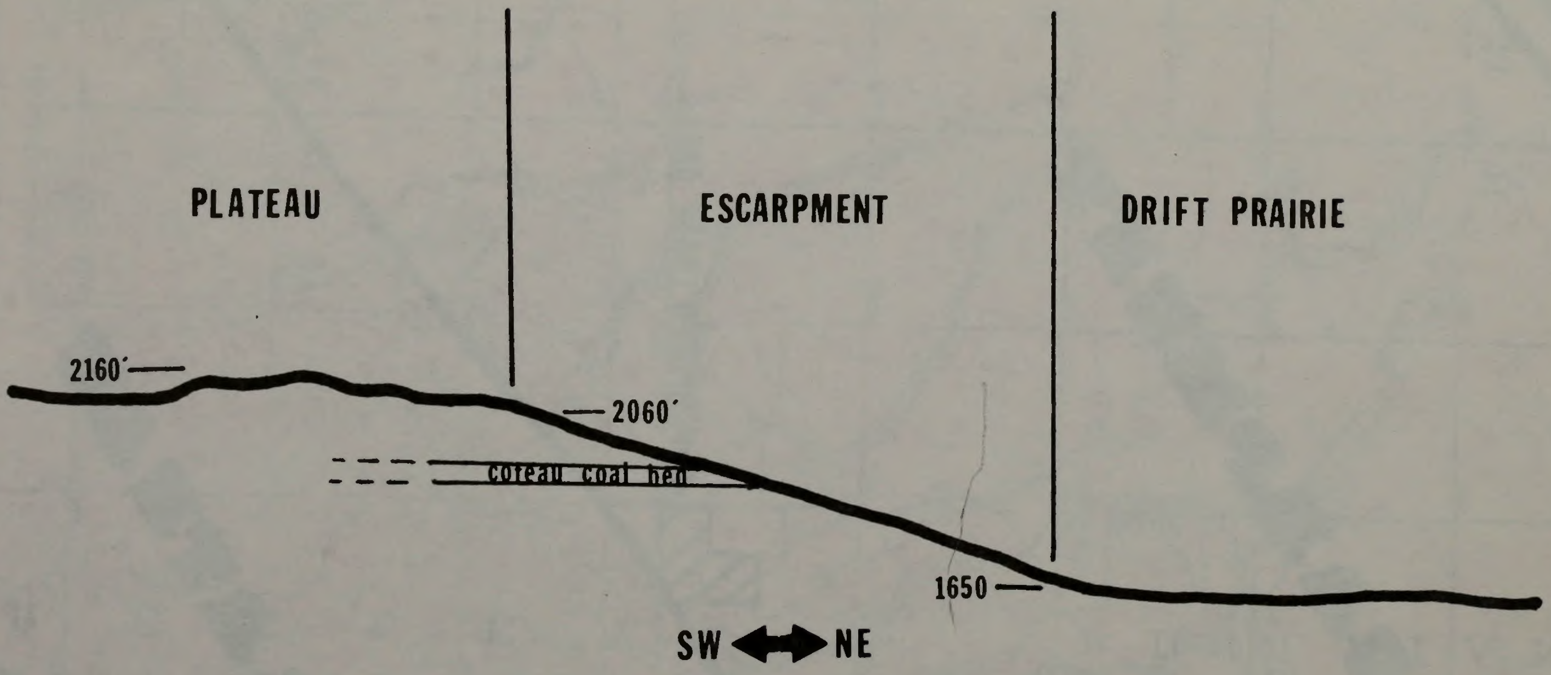


Figure A2-1. Topographic map of the Velva Mine and vicinity, with both the physiographic landforms and the proposed lease area delineated on it.



Physiographic Cross Section and Landform Units

Consol - Velva Mine
Velva, North Dakota

FIGURE A2-2

Table A2-1

Form 1600-6
(August 1969)

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

PHYSICAL PROFILE
HYDROLOGIC DATA

p. 1 of 3.

Unit Surface water monitoring station # 5-120000 on the Souris River near Verendrye, North Dakota	Date 1974 By U. S. Geological Survey

ITEM	UNIT	ESTIMATED ANNUAL AMOUNT	SOURCE REFERENCE*
1. Water Yield † (Discharge)	cfs	5.8 - 3420	# 1
2. Water Use †			
3. Sediment Production			
4. Other Pollutants ‡			
a. Silica (SiO_2) dissolved	mg/l	6.4 - 26	# 1
b. Iron (Fe) dissolved	ug/l	100 - 270	# 1
c. Manganese (Mn) dissolved	ug/l	20- 100	# 1
d. Calcium (Ca) dissolved	mg/l	34 - 130	# 1
e. Magnesium (Mg) dissolved	mg/l	18 - 66	# 1

Remarks

1 Pettyjohn, W. A. and Hutchinson, R. D., "Ground Water Resources of Renville and Ward Counties", USGS County Ground Water Study, Part III, 1971

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† 1 cu. ft./sec (cfs) = 2 ac. ft./day = 730 ac. ft./year. 1 gal./min = .00223 cfs = 1.63 ac. ft./year.

‡ Show total mean annual concentration of all salts on line 4. List mean annual concentration of major salts on lines 4a, b, c, etc.

* If additional space is required, footnote under "Remarks"

GPO 852-888

Form 1600-6
(August 1969)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

PHYSICAL PROFILE
HYDROLOGIC DATA

p. 2 of 3.

Unit # 5-120000 continued	Date By

ITEM	UNIT	ESTIMATED ANNUAL AMOUNT	SOURCE REFERENCE*
f. Sodium (Na) dissolved	mg/l	47 - 230	# 1
g. Potassium (K) dissolved	mg/l	9 - 13	# 1
h. Bicarbonate (HCO_3)	mg/l	173 - 654	# 1
i. Carbonate (CO_3)	mg/l	0	# 1
j. Alkalinity ($CaCO_3$)	mg/l	142 - 536	# 1
k. Sulfate (SO_4) dissolved	mg/l	100 - 500	# 1
l. Chloride (Cl) dissolved	mg/l	9.5 - 95	# 1
m. Fluoride (F) dissolved	mg/l	.2 - .8	# 1
n. Nitrite and Nitrate (N) dissolved	mg/l	.03 - .63	# 1
o. Ammonia Nitrogen (N)	mg/l	.04 - 1.1	# 1
p. Phosphorus (P) total	mg/l	.22 - 1.7	# 1
q. Phosphorus (P) dissolved	mg/l	.12 - 1.5	# 1
r. Ortho - Phosphorus (P) dissolved	mg/l	.09 - 1.4	# 1
s. Dissolved Solids (TDS)	mg/l	365 - 1200	# 1
t. Hardness (Ca, Mg)	mg/l	160 - 520	# 1
u. Non Carbonate Hardness	mg/l	0 - 60	# 1
v. Sodium (Na)	%	37 - 51	# 1
w. Sodium Absorption Ratio (SAR)	---	1.4 - 4.7	# 1
x. Specific Conductance (SC)	micro-mhos	540 - 1950	# 1
y. pH	---	7.5 - 8.2	# 1
z. Dissolved Oxygen	mg/l	1.6 - 8	# 1

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† 1 cu. ft./sec (cfs) = 2 ac. ft./day = 730 ac. ft./year. 1 gal./min = .00223 cfs = 1.63 ac. ft./year.

‡ Show total mean annual concentration of all salts on line 4. List mean annual concentration of major salts on lines 4a, b, c, etc.

* If additional space is required, footnote under "Remarks"

TABLE A2-1

Form 1600-6
(August 1969)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

PHYSICAL PROFILE
HYDROLOGIC DATA

p. 3 of 3.

Unit # 5-120000 continued	Date By

ITEM	UNIT	ESTIMATED ANNUAL AMOUNT	SOURCE REFERENCE*
aa. Fecal Coliform	Col. per 100 ml	13 - 32	# 1
bb. Cyanide (CN)	mg/1	0 - .01	# 1
cc. Arsenic (As) dissolved	ug/1	5 - 6	# 1
dd. Barium (Ba) dissolved	ug/1	0	# 1
ee. Beryllium (Be) dissolved	ug/1	0	# 1
ff. Boron (B) dissolved	ug/1	110 - 150	# 1
gg. Cadmium (Cd) dissolved	ug/1	0	# 1
hh. Chromium (Cr) dissolved	ug/1	0	# 1
ii. Cobalt (Co) dissolved	ug/1	0	# 1
jj. Copper (Cu) dissolved	ug/1	3 - 4	# 1
kk. Lead (Pb) dissolved	ug/1	1	# 1
ll. Lithium (Li) dissolved	ug/1	20 - 25	# 1
mm. Mercuty (Hg) dissolved	ug/1	0 - .3	# 1
nn. Molybdenum (Me) dissolved	ug/1	1 - 2	# 1
oo. Nickel (Ni) dissolved	ug/1	2	# 1
pp. Selenium (Se) dissolved	ug/1	0 - 3	# 1
qq. Silver (Ag) dissolved	ug/1	0	# 1
rr. Strontium (Sr) dissolved	ug/1	150 - 290	# 1
ss. Vanadium (V) dissolved	ug/1	.2 - 1.2	# 1
tt. Zinc (Zn) dissolved	ug/1	20 - 30	# 1

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† 1 cu. ft./sec (cfs) = 2 ac. ft./day = 730 ac. ft./year. 1 gal./min = .00223 cfs = 1.63 ac. ft./year

‡ Show total mean annual concentration of all salts on line 4. List mean annual concentration of major salts on lines 4a, b, c, etc.

* If additional space is required, footnote under "Remarks"

TABLE A2-1

CLASSIFICATION OF WATER BY TDS

Total Dissolved Solids (ppm)	Salinity Rating
0 - 1,000	Fresh
1,000 - 3,000	Slightly Saline
3,000 - 10,000	Moderately Saline or Brackish
10,000 - 35,000	Highly Saline
< 35,000	Brine

Note: As published by H. E. Simpson and H. L. Baldwin, "A Primer On Water Quality", U. S. Geological Survey Water Supply Paper, 1965

TABLE A2-2

BEDROCK GEOLOGIC UNITS

And Their Water Yielding Properties

Era	System	Series	Geologic unit	Physical character	Thickness (feet)	Water-yielding characteristics
Cenozoic	Tertiary	Paleocene	Fort Union Group	Sandstone, silt, shale, and lignite.	0-700	Generally of low permeability. Yields small quantities of water, generally adequate for domestic and stock use. Water may be saline and contain dissolved gas.
Mesozoic	Cretaceous	Upper Cretaceous	Hell Creek Formation	Mudstone, sandy shale, sandstone, and lignite.	200±	Relatively impermeable. May yield very small quantities of water in the area.
			Fox Hills Formation	Sandstone and shale.	235±	Permeable. Yield unknown.
			Pierre Formation	Consolidated bluish-gray to dark-gray marine shale, sandy in places, fossiliferous, contains many concretions in places.	1,200±	Relatively impermeable. May yield very small quantities of water from sand lenses and fractures common in the upper part.
			Colorado Group	Consolidated dark-gray shale, dense, calcareous, and bentonitic; also limestone, which may include alternating layers of shale and sandstone.	1,060±	Relatively impermeable. Not known to yield water in the area. Sandstone may yield limited supplies.
		Lower Cretaceous	Dakota Group	Sandstone, fine to coarse grained; consolidated, calcareous, and very bentonitic shale.	600±	Permeable. Yields large quantities of saline water from depths of 2,500± feet.

Note: Reference, W. A. Pettyjohn and R. D. Hutchinson, "Ground Water Resources of Renville and Ward Counties," USGS County Ground Water Studies, Part III, 1971.

TABLE A2-3

Form 1600–6
(August 1969)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

PHYSICAL PROFILE
HYDROLOGIC DATA

p. 1 of 2.

Unit Ward County Ground Water Quality Data from the Fort Union Group	Date 1968
	By U. S. Geological Survey

ITEM	UNIT	ESTIMATED ANNUAL AMOUNT	SOURCE REFERENCE*
1. Water Yield †	ac. ft.	Information Not Available	
2. Water Use †	ac. ft.		
3. Sediment Production	cu. yds.		
4. Other Pollutants ‡	ppm		
a. Silica (SiO_2)	ppm	1.7 - 21	# 1
b. Iron (Fe)	ppm	.19 - 8	# 1
c. Manganese (Mn)	ppm	0	# 1
d. Calcium (Ca)	ppm	6 - 142	# 1
e. Magnesium (Mg)	ppm	1.5 - 92	# 1

Remarks

# 1 Pettyjohn,W. A., "Geology and Ground Water Resources for Renville and Ward County", USGS County Ground Water Studies, Ground Water Basic Data, Part II, 1968

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† 1 cu. ft./sec (cfs) = 2 ac. ft./day = 730 ac. ft./year. 1 gal./min = .00223 cfs = 1.63 ac. ft./year.

‡ Show total mean annual concentration of all salts on line 4. List mean annual concentration of major salts on lines 4a, b, c, etc.

* If additional space is required, footnote under "Remarks"

Form 1600–6
(August 1969)

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

PHYSICAL PROFILE
HYDROLOGIC DATA

p. 2 of 2.

Unit Fort Union Group Continued	Date By

ITEM	UNIT	ESTIMATED ANNUAL AMOUNT	SOURCE REFERENCE*
f. Sodium (Na)	ppm	36 - 1580	# 1
g. Potassium (K)	ppm	3.8 - 20	# 1
h. Bicarbonate (HCO_3)	ppm	207 - 1900	# 1
i. Carbonate (CO_3)	ppm	0 - 48	# 1
j. Sulfate (SO_4)	ppm	206 - 2340	# 1
k. Chloride (Cl)	ppm	4 - 390	# 1
l. Fluoride (F)	ppm	.5 - 25	# 1
m. Nitrate (NO_3)	ppm	.25 - 10	# 1
n. Boron (B)	ppm	.12 - .58	# 1
o. Total Dissolved Solids (TDS)	ppm	864 - 4740	# 1
p. Hardness (Ca, Mg)	ppm	26 - 710	# 1
q. Noncarbonate Hardness	ppm	0 - 380	# 1
r. Sodium Absorption Ratio (SAR)	---	.9 - 8	# 1
s. Specific Conductance (SC)	micro-mhos	1234 - 6270	# 1
t. pH	------	7.5 - 8.4	# 1

† 1 cu. ft./sec (cfs) = 2 ac. ft./day = 730 ac. ft./year. 1 gal./min = .00223 cfs = 1.63 ac. ft./year.

‡ Show total mean annual concentration of all salts on line 4. List mean annual concentration of major salts on lines 4a, b, c, etc.

* If additional space is required, footnote under "Remarks"

TABLE A2-4 Con't.

APPENDIX 2

SOILS

Bowbells Series

The Bowbells series consists of deep, level and gently sloping, moderately well drained soils that formed in glacial till and local alluvium derived from the till. These soils are on upland till plains. Slopes range from 0 to 5 percent and are plane or concave.

In a representative profile, the surface layer is very dark brown loam about 6 inches thick. The subsoil is very dark grayish brown, friable, clay loam about 17 inches thick. The underlying material, to a depth of 36 inches, is friable, calcareous, light olive brown loam. Below 36 inches it is a firm, olive brown loam glacial till.

Bowbells soils are well suited to cultivated crops, grass, and trees. Most areas are used for crops.

Mine Pits and Dumps

Mine pits and dumps (Mp) are areas where strip mining has removed soil material to a depth of 30 to 60 feet. The dumped waste material forms complex, irregular shaped ridges more than 50 feet high. The largest area is in the southeastern part of the county.

This land type is suited to wildlife habitat and to grass. Reseeding, restoring fertility, and leveling the steep ridges are concerns of management. Surface runoff from the steep areas and the spread of sediment are hazards.

Wabek Series

The Wabek series consists of level to hilly, excessively drained soils that formed in sand and gravel outwash material. Slopes range from 1 to 20 percent and are plane and convex. Sandy and gravelly material is at a depth of 4 to 8 inches.

In a representative profile, the surface layer is very dark grayish brown, gravelly or sandy loam about 6 inches thick. The underlying material, to a depth of about 12 inches, is dark grayish brown, loamy, coarse sand. Below this, it is grayish brown and olive brown, coarse sand and gravel.

Wabek soils are better suited to grassland than to other uses.

Williams Series

The Williams series consists of deep, level to strongly sloping, well-drained soils that formed in loamy glacial till on glacial plains. Slopes range from 0% to 12% and are plane or convex.

In a representative profile, the surface layer is very dark brown loam about 6 inches thick. The subsoil is about 12 inches thick. It is dark brown, friable, clay loam in the upper part and olive brown, clay loam in the lower part. The underlying material, to a depth of 30 inches, is friable loam that is high in lime. Below this, it is firm olive and gray loam.

Williams soils are well suited to small grains, grasses, legumes, and trees. Most areas are used for crops.

Zahl Series

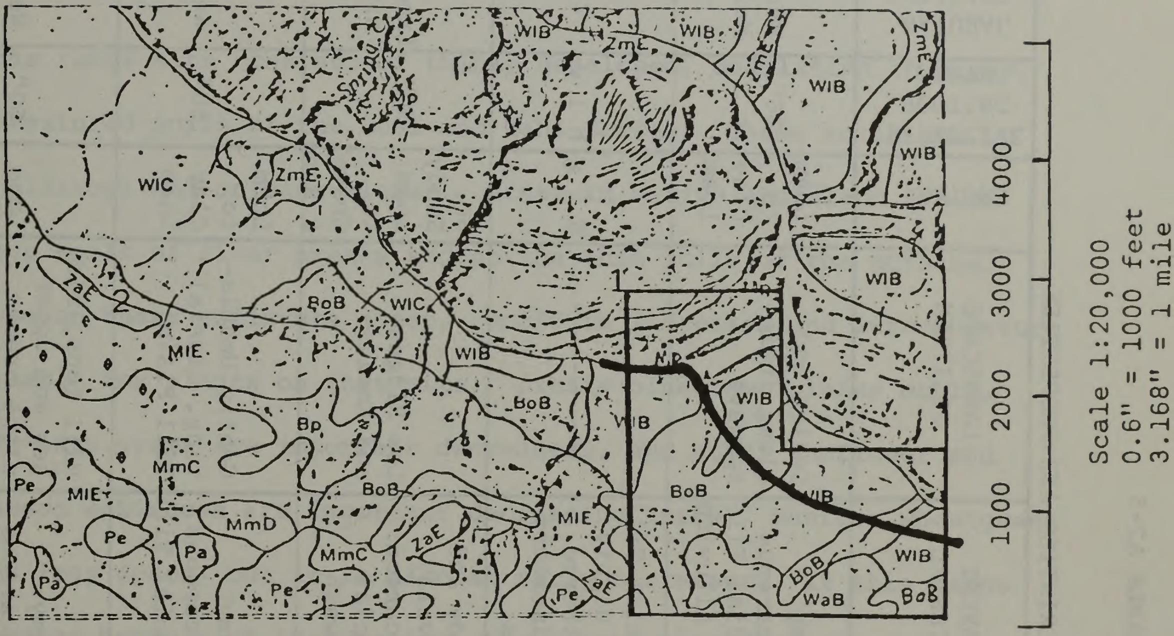
The Zahl series consists of deep, rolling to steep, well-drained soils that formed in loamy glacial till. These soils are on glacial moraines and slope breaks. Slopes range from 6% to 60% and are convex.

In a representative profile, the surface layer is very dark gray and very dark brown loam about 6 inches thick. The underlying material, to a depth of about 15 inches, is dark grayish brown, friable loam that is high in lime. Below this, it is friable, olive brown, loam that, at a depth of about 30 inches, grades to firm olive gray loam.

Zahl soils are better suited to grass and legumes than to crops.

FIGURE A2-3

T 151 N R 81 W
S1/2 SE1/4, NW1/4 SE1/4 Sec. 1



Map Symbol	Map Unit and Slope	Acres	% of Area
BoB	Bowbells loam, 2-5%	28	23
Mp	Mine Pits and Dumps	55	46
WaB	Wabek soils, 0-6%	17	15
WIB	Williams loam, 2-4%	15	12
ZaE	Zahl loam, hilly, 9-20%	5	4
		120	100

Soil Series	Family Classification	Subgroup Classification
Bowbells	Fine-Loamy, Mixed	Pachic Argiborolls
Mine Pits and Dumps	Miscellaneous Land Type	
Wabek	Sandy-Skeletal, Mixed	Entic Haploborolls
Williams	Fine-Loamy, Mixed	Typic Argiborolls
Zahl	Fine-Loamy, Mixed	Entic Haploborolls

TABLE A2-5

SOIL CHARACTERISTICS AND PROPERTIES

MAP SYMBOL	MAP UNIT AND SLOPE	CAPABILITY CLASS	RANGE SITE	PARENT MATERIAL	LANDSCAPE POSITION	TEXTURE	EFFECTIVE ROOTING DEPTH	NATURAL DRAINAGE	PERM-EABILITY	AVAILABLE WATER CAPACITY	PH
BoB	Bowbells Loam 2-5%	IIe6	Silty	Loamy Calcareous Glacial Till and Alluvium	Swales and along drainageways	Loam to Clay Loam	36"	Mod. Well	Mod. to 36"	High	6.6 to 8.4
Mp	Mine Pits and Dumps	VIIIe	---	Glacial Till and Highly Weathered Sedimentary Beds	-----------	Highly Variable ------					
WaB	Wabek Soils 0-6%	VIs	SWG Shallow to Gravel	Sandy and Gravelly Calcareous Glacial Outwash	Low Ridges and Knolls	Gr. Sandy Loam to Gravel & Sand	60"	Excessive	Very Rapid	Low	6.6 to 8.4
WIB	Williams Loam 2-4%	IIe6	Silty	Loamy Calcareous Glacial Till	Gently Undulating, Glacial Till Plain	Loam to Clay Loam	60"	Well	Mod. to Mod. Slow	High	6.6 to 8.4
ZaE	Zahl Loam, Hilly, 9-20%	VIe	TSi Thin Silty	Loamy Calcareous Glacial Till	Hill tops, ridges and upper slope breaks of moraines	Loam	60"	Well	Mod. to Mod. Slow	High	6.6 to 8.4

APPENDIX 2

VEGETATION

Thin Silty Range Site

This range site consists of thinly developed, undulating to steep, medium-textured soils of the Buse and Zahl series. These soils are on convex hilltops and on side slopes. Areas in native grassland are on the steep soils of river breaks and on the thin soils of the moraine.

Because these soils are steep, runoff is increased and less moisture is available for plants on this site. Little bluestem, plains muhly, and side-oats grama are important decreasers, and stiff sunflower and blacksamson echinacea are important decreasing forbs. Western wheatgrass occupies less space, but it is also an early decreaser. If this range deteriorates because of overgrazing, the plant cover decreases, and runoff and erosion increase. Overgrazing causes an increase of blue grama, needle-and-thread, needleleaf sedge, fringed sagewort, and other short and undesirable vegetation, but this increase does not off-set the overall decrease in plant cover.

If this site is in excellent condition, the estimated average yield of herbage, per acre, ranges from 700 pounds in unfavorable years to 2,000 pounds in favorable years.

Adapted from "Soil Survey of Ward County, North Dakota" by the Soil Conservation Service - U.S. Department of Agriculture. 1974.

SILTY RANGE SITE

1. TOPOGRAPHY

a. This site occurs on nearly level to strongly sloping glacial till uplands and on stream terraces. Slopes are commonly from one to 15 percent.

2. SOILS

a. These are deep, well and moderately well drained, medium and moderately fine textured soils. Permeability is moderate to moderately slow and available water capacity is high and very high.

b. Soil taxonomic units common to this site are:

Bowbells loam, B and C slopes
Farland loam
Linton silt loam
Max loam
Roseglen silt loam
Williams loam

Refer to Section II-A for a complete list of soil taxonomic units and range sites.

3. POTENTIAL VEGETATION

a. This site is dominated by cool-season midgrasses. Principal species are needleandthread, western wheatgrass, green needlegrass, and blue grama. Other species are prairie junegrass, porcupinegrass, prairie dropseed, Kentucky bluegrass, and upland sedges. A variety of forbs make up about 10 percent of the total herbage production. Shrub species such as western snowberry and prairie rose occur in small amounts.

b. Continued heavy grazing by cattle results in a decrease of green needlegrass, porpcupinegrass, prairie dropseed, and bearded wheatgrass. Grasses such as needleandthread, western wheatgrass, and prairie junegrass increase initially and then decrease if heavy grazing is continued. Species that increase are blue grama, Kentucky bluegrass, needleleaf sedge, and fringed sagebrush. Further derioration results in a dominance of short grasses, upland sedges, fringed sagebrush, and several undesirable forbs such as western ragweed and green sagewort.

c. Approximate total annual production of this site in excellent condition is from 1800 to 2400 pounds of air-dry herbage per acre, depending on growing conditions.

d. A detailed description of the vegetation in excellent condition is as follows:

Relative Percent Composition of the Potential Vegetation

	Mean Productivity	
	lbs/acre	% composition
Grasses		
Needleandthread	430	20
Western wheatgrass	430	20
Green needlegrass	215	10
Prairie junegrass	108	5
Blue grama	215	10
Porcupinegrass	108	5
Kentucky bluegrass	107	5
Prairie dropseed Bearded wheatgrass Other grasses	T*	-
Grasslikes		
Penn sedge Threadleaf sedge Other sedges	215	10
Forbs		
Woolly goldenrod Heath aster Western ragweed Western yarrow Gray sagewort Stiff sunflower Dotted gayfeather Silverleaf scurfpea Other forbs	215	10
Shrubs and half-shrubs		
Fringed sagebrush Western snowberry Prairie rose Other shrubs	107	5
Total	2150	100

* T refers to trace amounts, 2½ percent weight or less.

4. DOMESTIC LIVESTOCK GRAZING VALUE

a. This site is suitable for both cattle and sheep. The best season of grazing is summer; however, the site also has spring and fall grazing value. Silty range sites grazed during the spring need to be rested periodically to improve and maintain plant composition.

5. WILDLIFE NATIVE TO THE SITE

a. This site is used by the white-tailed deer and antelope. Smaller mammals commonly found are the jackrabbit, red fox, and pocket gopher. Upland birds depending on this site for part of their natural habitat are the sharp-tailed grouse, mourning dove, and meadowlark. Songbirds commonly found are the lark bunting, horned lark, chestnut-collared longspur, and bobolink. Sites traversed by channels with trees and shrubs attract several more species of birds such as the red-winged blackbird, brown thrasher, eastern kingbird, and yellow warbler. Sites with water attract waterfowl such as the mallard, pintail, bluewinged teal, and shoveller.

6. ESTHETIC AND RELATED VALUES

a. This site makes up a large part of the rolling grasslands and gives one the enjoyment of open space. A large variety of flowering plants add color to the landscape in spring and summer. Recreational activities associated with this site are hunting, hiking, horseback riding, plant study, and winter sports.

7. HYDROLOGIC CHARACTERISTICS

a. This site is common to most watersheds and is extensive in this vegetation zone. Runoff is slow to medium on good to excellent condition, properly grazed range. Water transmission rate of the soil is moderate.

8. A TYPICAL SITE LOCATION IN THIS AREA IS AS FOLLOWS

SHALLOW TO GRAVEL RANGE SITE

1. TOPOGRAPHY

   a. This site occurs on nearly level to gently sloping outwash plains and stream terraces. Slopes are commonly from one to four percent.

2. SOILS

   a. These are shallow, medium and moderately coarse textured soils overlying sand and gravel at about 20 inches. They are well to somewhat excessively drained. Permeability is moderate and available water capacity is low.

   b. Soil taxonomic units common to this site are:

      Lehr loam and sandy loam

      Refer to Section II-A for a complete list of soil taxonomic units and range sites.

3. POTENTIAL VEGETATION

   a. Cool-season species dominate the general appearance of this site. Principal species are needleandthread, western wheatgrass, green needlegrass, and blue grama. Other species are prairie junegrass, plains muhly, red threeawn, porcupinegrass, Kentucky bluegrass, and upland sedges. A variety of forbs make up about 10 percent of the total herbage produced. Several shrub species occur in minor amounts.

   b. Continued heavy grazing by cattle results in a decrease of green needlegrass, western wheatgrass, prairie junegrass, and plains muhly. Needleandthread initially increases and then decreases under this grazing regime. Species that increase are blue grama, red threeawn, Kentucky bluegrass, and upland sedges. Further deterioration of this site results in a dominance of blue grama, Kentucky bluegrass, upland sedges, fringed sagebrush, and undesirable forbs.

   c. Approximate total annual production of this site in excellent condition is from 1250 to 1850 pounds of air-dry herbage per acre, depending on growing conditions.

d. A detailed description of the vegetation in excellent condition is as follows:

Relative Percent Composition of the Potential Vegetation

	Mean Productivity	
	lbs/acre	% composition
Grasses		
Needleandthread	542	35
Western wheatgrass	155	10
Green needlegrass	155	10
Prairie junegrass	78	5
Blue grama	155	10
Plains muhly Red threeawn Porcupinegrass Kentucky bluegrass Other grasses	78	5
Grasslikes		
Penn sedge Needleleaf sedge Other sedges	155	10
Forbs		
Rush skeletonplant Scarlet globemallow Dotted gayfeather Woolly goldenrod Hoods phlox Other forbs	155	10
Shrubs and half-shrubs		
Fringed sagebrush Prairie rose Western snowberry Other shrubs	77	5
Total	1550	100

4. DOMESTIC LIVESTOCK GRAZING VALUE

a. This site is suited for both cattle and sheep grazing. The best season of grazing is summer; however, the site also has spring and fall grazing value. Rnage sites grazed during the spring need a periodic rest to improve and maintain plant composition.

5. WILDLIFE NATIVE TO THE SITE

a. This site is used by antelope and white-tailed deer for forage. Small mammals commonly found are red fox, jackrabbit, and Richardson's ground squirrel. Upland birds such as the sharp-tailed grouse, mourning dove, and meadowlark use this site. Songbirds found on this site are the eastern kingbird, horned lark, and lark bunting.

6. ESTHETIC AND RELATED VALUES

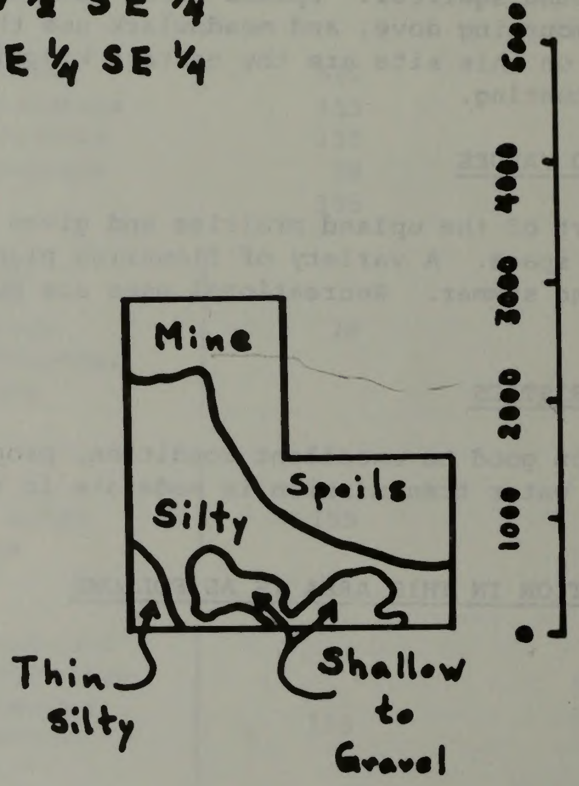
a. This site is part of the upland prairies and gives one the enjoyment of open space. A variety of flowering plants bloom during spring and summer. Recreational uses are hunting and hiking.

7. HYDROLOGIC CHARACTERISTICS

a. Runoff is slow on good to excellent condition, properly grazed range. Rate of water transmission is moderate in the soil profile.

8. A TYPICAL SITE LOCATION IN THIS AREA IS AS FOLLOWS

T. 151 N., R. 81 W.
Section 1
W ½ SE ¼
SE ¼ SE ¼



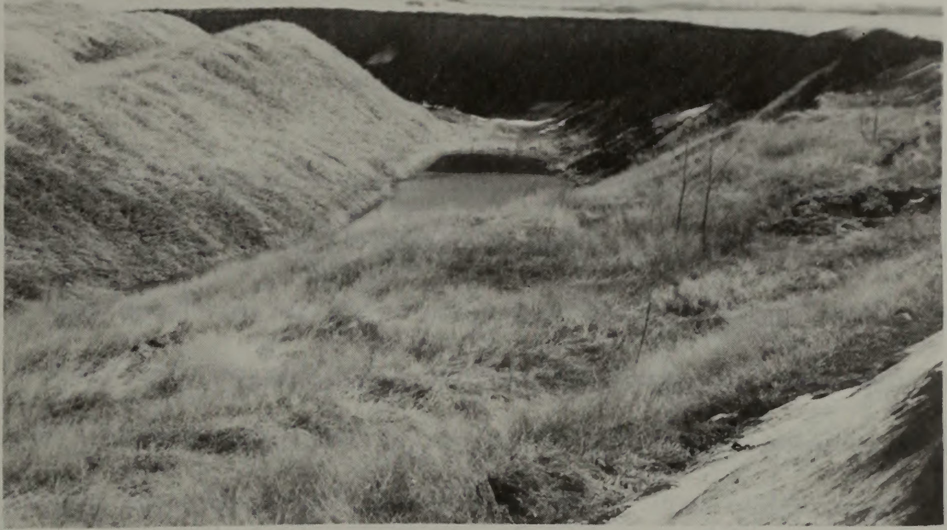
Range Site	Acres	% of Area
Mine Spoils	56	47%
Silty	45	38%
Shallow to Gravel	14	12%
Thin Silty	5	3%
Total	120	100%

Figure A2-4

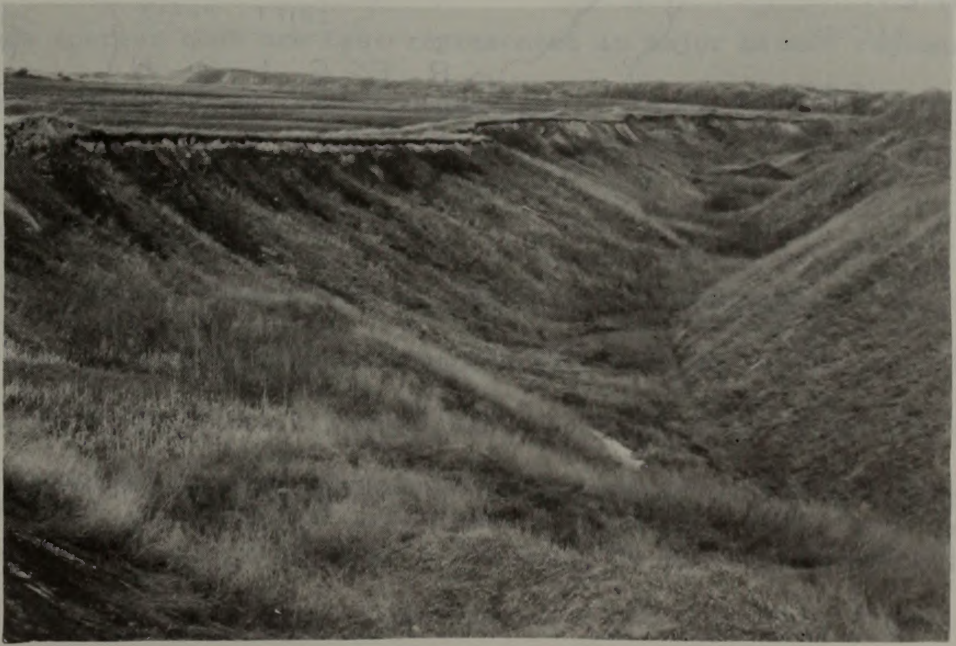
U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Velva Coal Mine
Range Sites

DESIGNED___	RECOMM.___
DRAWN DAR	RECOMM.___ CHIEF, DIV. OF ENG.
CHECKED___	APPROVED___
SCALE 0.6" = 1000 feet	
DATE 5-4-76	SHEET 1 OF 1
DRAWING NO.	



Pond in the final pit of the old coal mine spoils. Consol-Velva Coal Mine-Velva, North Dakota. T. 151 N., R. 81 W., Section 1, SE¼SE¼. 4/6/76. Viewed looking east.

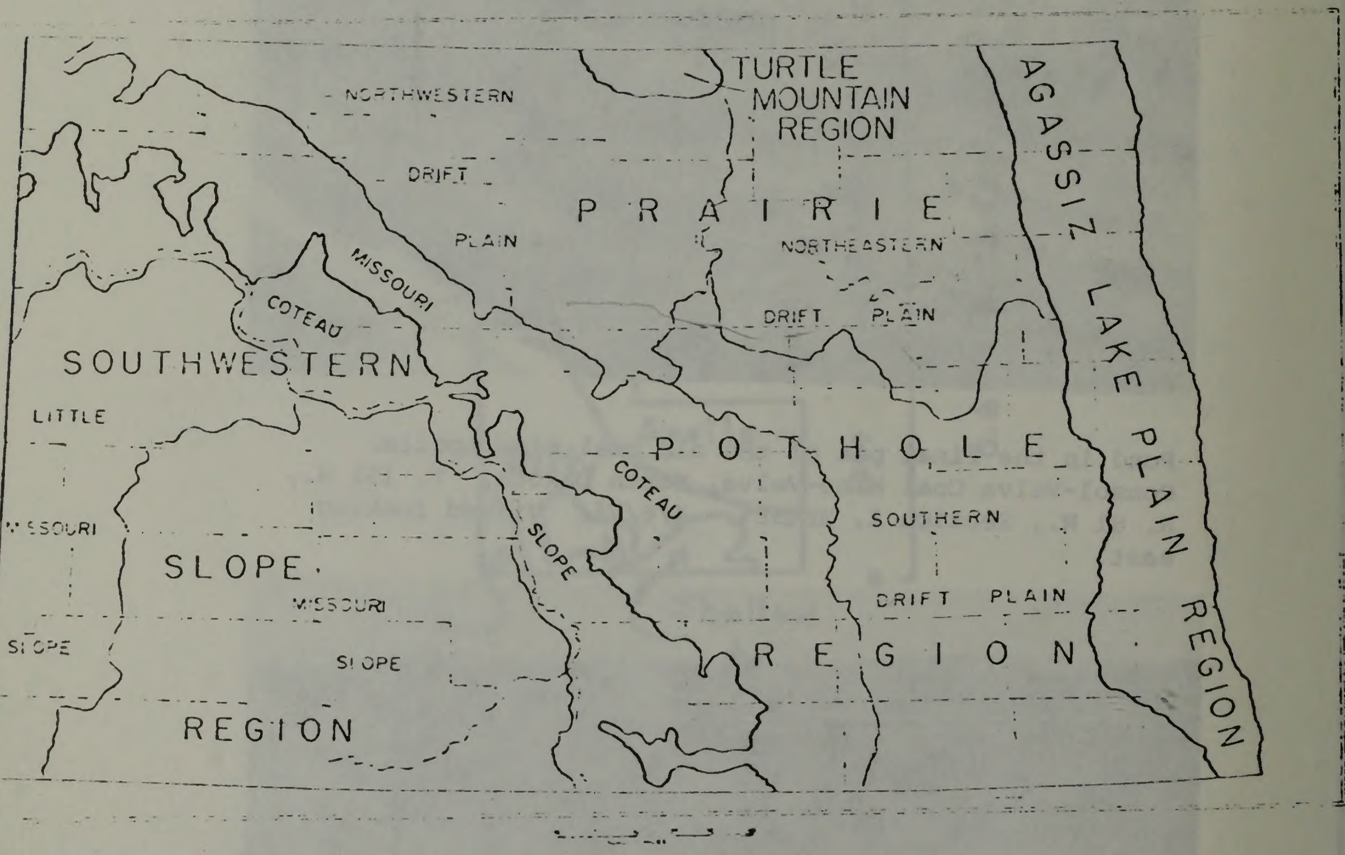


Pond in the final pit of the old coal mine spoils. Consol-Velva Coal Mine-Velva, North Dakota. T. 151 N., R. 81 W., Section 1, SE¼SE¼. 4/6/76. Viewed looking northwest.

APPENDIX 2

FIGURE A2-5

Biotic areas of North Dakota.



Adapted directly from "Breeding Birds of North Dakota" by Robert E. Stewart dated 1975. Tri-College Center for Environmental Studies. Fargo, North Dakota.

APPENDIX 2

FAUNISTIC COMPOSITION OF BREEDING BIRDS

Adapted directly from "Breeding Birds of North Dakota"
by Robert E. Stewart dated 1975.
Tri-College Center for Environmental Studies.
Fargo, North Dakota

The breeding birds of North Dakota are composed of four distinct faunistic elements. Each of these elements represents a group of species that show similar biogeographical relationships. One primary group, referred to as the North-central Avifauna, includes typical species of the northern prairie region on the central plains that are of paramount importance throughout the state. The other groups, of secondary importance, are restricted to somewhat limited populations that are of local occurrence wherever appropriate habitat conditions are found. These, referred to as the Eastern, Western, and Northern Avifaunas, include species that are best represented in major biotic regions, or biomes, outside of the state boundaries.

North-Central Avifauna

The typical species occupy various upland and wetland habitats that represent natural successional stages leading to and including the climax mixed-grass prairie associations. A total of 56 species of birds are representative. These include seven species largely endemic within the northern mixed-grass prairie regions--the Marbled Godwit, Sprague's Pipit, Lark Bunting, Baird's Sparrow, Le Conte's Sparrow, Clay-colored Sparrow, and Chestnut-collared Longspur--and 49 pandemic species. The species in the latter group also are of regular occurrence in other major biotic regions.

Characteristic Species

Eared Grebe
Western Grebe
Pied-billed Grebe
White Pelican
Trumpeter Swan
Canada Goose
Gadwall
Mallard
Pintail
Blue-winged Teal
Northern Shoveler
Canvasback
Redhead
Ruddy Duck
Ferruginous Hawk
Marsh Hawk
Sharp-tailed Grouse
Whooping Crane
Sandhill Crane
Sora
American Coot
Piping Plover
Killdeer
Upland Plover
Willet
Marbled Godwit
American Avocet
Wilson's Phalarope
Franklin's Gull
Double-crested Cormorant
American Bittern
Black-crowned Night Heron
Forster's Tern
Black Tern
Burrowing Owl
Short-eared Owl
Common Nighthawk
Horned Lark
Bank Swallow
Long-billed Marsh Wren
Sprague's Pipit
Common Yellowthroat
Bobolink
Western Meadowlark
Red-winged Blackbird
Brown-headed Cowbird
Yellow-headed Blackbird
Lark Bunting
Savannah Sparrow
Baird's Sparrow
Grasshopper Sparrow
Le Conte's Sparrow
Sharp-tailed Sparrow
Vesper Sparrow
Clay-colored Sparrow
Chestnut-collared Longspur

Eastern Avifauna

Species that typify this group are represented by considerable populations in various habitats within the eastern half of the state but occur more sparingly in the western half. Many of these 71 species are especially conspicuous in woodland biotic communities located on floodplains and bluffs along major streams, on prominent hills and escarpments, and as concentric bands that adjoin the shores of permanent lakes. Man-created woodland habitats including tree-claims, shelterbelts, and residential areas of towns and farmsteads are commonly utilized as well. Some of these species are also characteristic of other avifaunas.

Characteristic Species

Least Bittern
Green Heron
Great Blue Heron
Wood Duck
Cooper's Hawk
Red-tailed Hawk
Bald Eagle
American Kestrel 1/
Greater Prairie Chicken
Virginia Rail
Least Tern
Mourning Dove 1/
Passenger Pigeon
Black-billed Cuckoo
Screech Owl
Great Horned Owl
Barred Owl
Long-eared Owl
Whip-poor-will
Chimney Swift
Ruby-throated Hummingbird
Belted Kingfisher
Downy Woodpecker
Hairy Woodpecker
Red-headed Woodpecker
Yellow-shafted Flicker
Pileated Woodpecker
Eastern Kingbird
Great Crested Flycatcher
Eastern Phoebe
Willow Flycatcher
Least Flycatcher
Eastern Wood Pewee
Purple Martin
Rough-winged Swallow
Barn Swallow
Blue Jay
Common Crow
Black-capped Chickadee
White-breasted Nuthatch
House Wren
Short-billed Marsh Wren
Brown Thrasher
Gray Catbird
American Robin
Veery
Eastern Bluebird
Cedar Waxwing
Loggerhead Shrike 1/
Yellow-throated Vireo
Red-eyed Vireo
Warbling Vireo
Black-and-white Warbler
Yellow Warbler
Chestnut-sided Warbler
American Redstart
Ovenbird
Common Grackle
Baltimore Oriole
Orchard Oriole
Scarlet Tanager
American Goldfinch
Dickcissel
Cardinal
Rose-breasted Grosbeak
Indigo Bunting
Eastern Rufous-sided Towhee
Lark Sparrow 1/
Chipping Sparrow 1/
Field Sparrow 1/
Song Sparrow

1/ Species also characteristic of Western Avifauna.

Western Avifauna

This group involves 37 species that are quite prominent in the southwestern quarter of North Dakota and are represented by fairly large, local populations in the northwestern quarter. The breeding ranges of a few species also extend into the eastern half of the state. Most species occupy the habitat complexes of the western badlands but also occur in various types of woodland communities and in xerophytic tracts of the northern shrub desert.

Characteristic Species

- Turkey Vulture
- Sharp-shinned Hawk
- Prairie Falcon
- Peregrine Falcon
- Merlin
- American Kestrel 2/
- Sage Grouse
- Mountain Plover
- Long-billed Curlew
- California Gull
- Mourning Dove 2/
- Poor-will
- Red-shafted Flicker
- Western Kingbird
- Say's Phoebe
- Western Wood Pewee
- Cliff Swallow
- Black-billed Magpie
- Rock Wren
- Swainson's Hawk
- Golden Eagle
- Common Raven
- Mountain Bluebird
- Loggerhead Shrike 2/
- Bell's Vireo
- Audubon's Warbler
- Yellow-breasted Chat
- Brewer's Blackbird
- Bullock's Oriole
- Black-headed Grosbeak
- Lazuli Bunting
- Spotted Rufous-sided Towhee
- Lark Sparrow 2/
- Chipping Sparrow 2/
- Brewer's Sparrow
- Field Sparrow 2/
- McCown's Longspur

2/ Species also characteristic of Eastern Avifauna.

BIOGEOGRAPHICAL DISTRIBUTION OF BREEDING BIRDS

In North Dakota, four biotic regions are recognized. These are referred to as the Agassiz Lake Plain Region, the Prairie Pothole Region, the Southwestern Slope Region, and the Turtle Mountain Region (Figure A2-5). Each region is distinguished primarily on the basis of major proportional differences in prominence of floristic and faunistic groups of species. On the basis of secondary differences in biotic relationships and on differences in prevalence of habitats, the Prairie Pothole Region and the Southwestern Slope Region are subdivided into biotic subregions.

Birds of the Prairies Pothole Region

The Prairie Pothole Region (Figure A2-5) covers about half (50.9 percent) of the total state area. This heavily glaciated area contains a considerable variety of glacial land forms, and innumerable shallow basin wetlands occur throughout. It encompasses two physiographic regions known as the Drift Plain and Missouri Coteau.

Throughout the Drift Plain, gently rolling ground moraine is the prevalent glacial land form. Locally, fairly extensive areas of lake plain occur including the Souris Lake Plain in Bottineau and McHenry Counties, the Devils-Cando Lake Plain in Ramsey and Towner Counties, and the Dakota Lake Plains in Dickey and Sargent Counties. In addition, other land forms including dead-ice moraine, end moraine, glacial outwash, deltaic sand, kame, and esker are of local importance. In certain areas, deep glacial meltwater channels, often called coulees, are prominent along some of the major streams and their tributaries.

On the Missouri Coteau, dead-ice moraine, which is characterized by knob-and-kettle topography, is generally prevalent. Large areas of glacial outwash also are present particularly in Kedder and McLean Counties. End moraines are prominent in certain portions of the Missouri Coteau, and small areas of ground moraine, lake plain, deltaic sand, kames, and eskers occur. The natural basin wetlands on the Missouri Coteau average somewhat larger and deeper than those on the Drift Plain and contain surface water that tends to be of greater permanence. On glacial outwash areas, the wetlands are often quite distinctive, being much more saline than those found elsewhere.

Four distinct biotic subregions that may be recognized within the Prairie Pothole Region are based on proportional variations in area of glacial land forms and differences in environmental conditions and biogeographical relationships. These are regerred to as the Northeastern, Southern, and Northwestern Drift Plains, and Missouri Coteau (Figure A2-5).

The climax biotic community of the Prairie Pothole Region is represented by the eastern mixed-grass prairie. Fairly extensive tracts of this type of native prairie, often heavily grazed, still exist, particularly on areas of end moraine, dead-ice moraine, glacial outwash, and on kames and eskers. Locally, isolated tracts of tall-grass prairie are present in well-drained lowlands near pond margins, along intermittent streams, and on north- or east-facing slopes of hills. Small disjunct areas of western mixed-grass prairie also occur on the summits and upper slopes of the higher morainic hills.

On ground moraine and on many tracts of other glacial land forms, the natural grasslands have been largely destroyed by man and replaced by very extensive acreages of croplands. The principal crops in the region are wheat, oats, barley, and flax; while fairly large corn fields and alfalfa or sweetclover hayfields may be found locally.

Habitats of major importance in the region also include a considerable variety of shallow basin wetlands. Other habitats of local importance are fluviatile and man-made wetlands, isolated small tracts of deciduous forest, and residential areas of man. Fluviatile wetlands include permanent and intermittent streams and their associated oxbows; man-made wetlands are represented by stock ponds, dugouts, large shallow-stream impoundments, reservoirs, and sewage lagoons. Dedicuous forests include narrow bands of floodplain forest along the Sheyenne, James, and Mouse rivers and their tributaries; local upland forests on river bluffs and high morains and along margins of permanent lakes; scattered thickets of small trees or aspen groves on the prairie; and tree-claims, shelterblets, and other wooded habitats established by man. The partially wooded residential areas of man are commmonly represented by farmsteads, towns, and city suburbs.

The breeding birds are composed preponderantly of upland and wetland species that are characteristic of the North-central Avifauna, including endemic and pandemic species. Species typical of the Eastern Avifauna are fairly prominent along permanent streams and in other wooded habitats on the Northeastern and Southern Drift Plains but occur more sparingly elsewhere. Small local populations of a few species that belong to the Western and Northern Avifaunas also occur in this region.

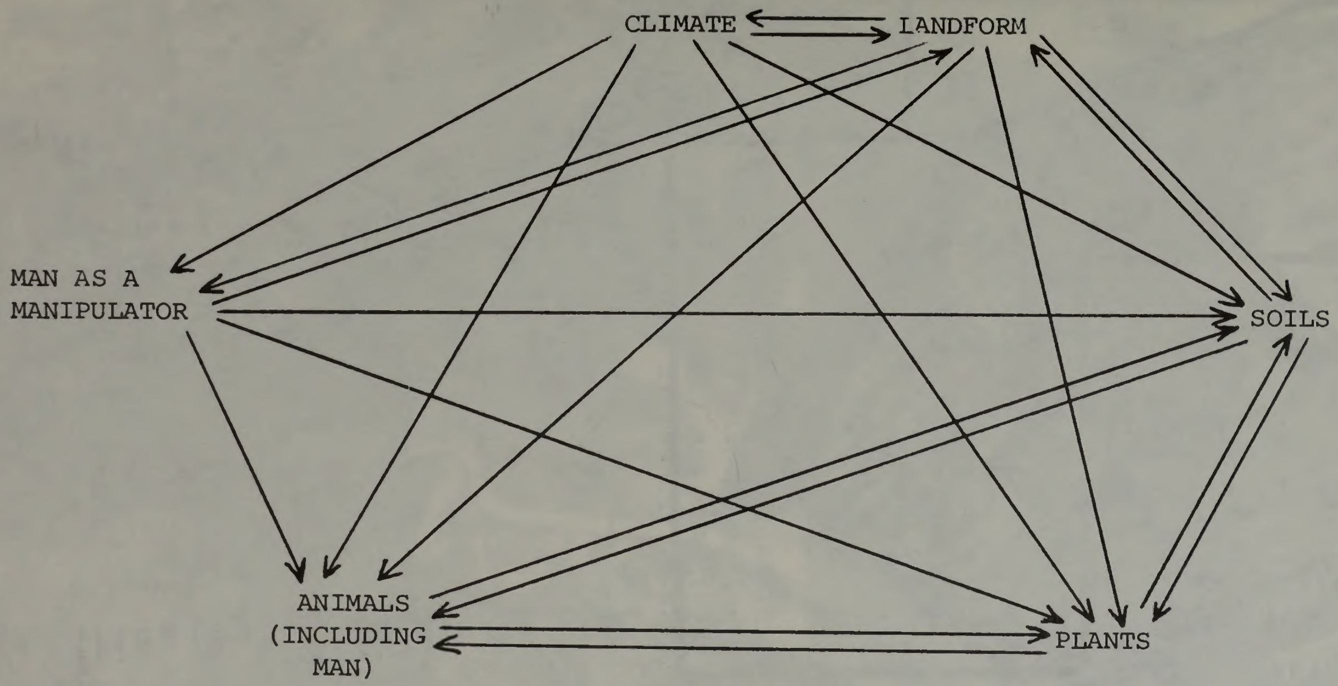
The characteristic breeding birds of this region include 16 primary species, 52 secondary species, and 79 tertiary, or minor, species. The primary and secondary species are listed as follows:

Primary Species

- Gadwall
- Mallard
- Pintail
- Blue-winged Teal
- Northern Shoveler
- American Coot
- Black Tern
- Mourning Dove
- Horned Lark
- Western Meadowlark
- Red-winged Blackbird
- Yellow-headed Blackbird
- Brown-headed Cowbird
- Savannah Sparrow
- Clay-colored Sparrow
- Chestnut-collared Longspur

Secondary Species

- Eared Grebe
- Pied-billed Grebe
- American Bittern
- Black-crowned Night Heron
- American Wigeon
- Americna Green-winged Teal
- Canvasback
- Redhead
- Ruddy Duck
- Swainson's Hawk
- Red-tailed Hawk
- Marsh Hawk
- Sharp-tailed Grouse
- Ring-necked Pheasant
- Gray Partridge
- Sora
- Killdeer
- Upland Plover
- Willet
- Marbled Godwit
- American Avocet
- Bobolink
- Common Crackle
- American Goldfinch
- Lark Bunting
- Wilson's Phalarope
- Franklin's Gull
- Ring-billed Gull
- Balck-billed Cuckoo
- Great Horned Owl
- Yellow-shafted Flicker
- Eastern Kingbird
- Western Kingbird
- Willow Flycatcher
- Bank Swallow
- Barn Swallow
- Cliff Swallow
- Common Crow
- House Wren
- Long-billed Marsh Wren
- Brown Thrasher
- Gray Catbird
- American Robin
- Sprauge's Pipit
- Cedar Waxwing
- Yellow Warbler
- Common Yellowthroat
- House Sparrow
- Baird's Sparrow
- Grasshopper Sparrow
- Vesper Sparrow
- Song Sparrow



Each ecological land unit (ELU) has a relationship between living and non-living components. Each component is influenced to some degree by the others.

FIGURE A2-6

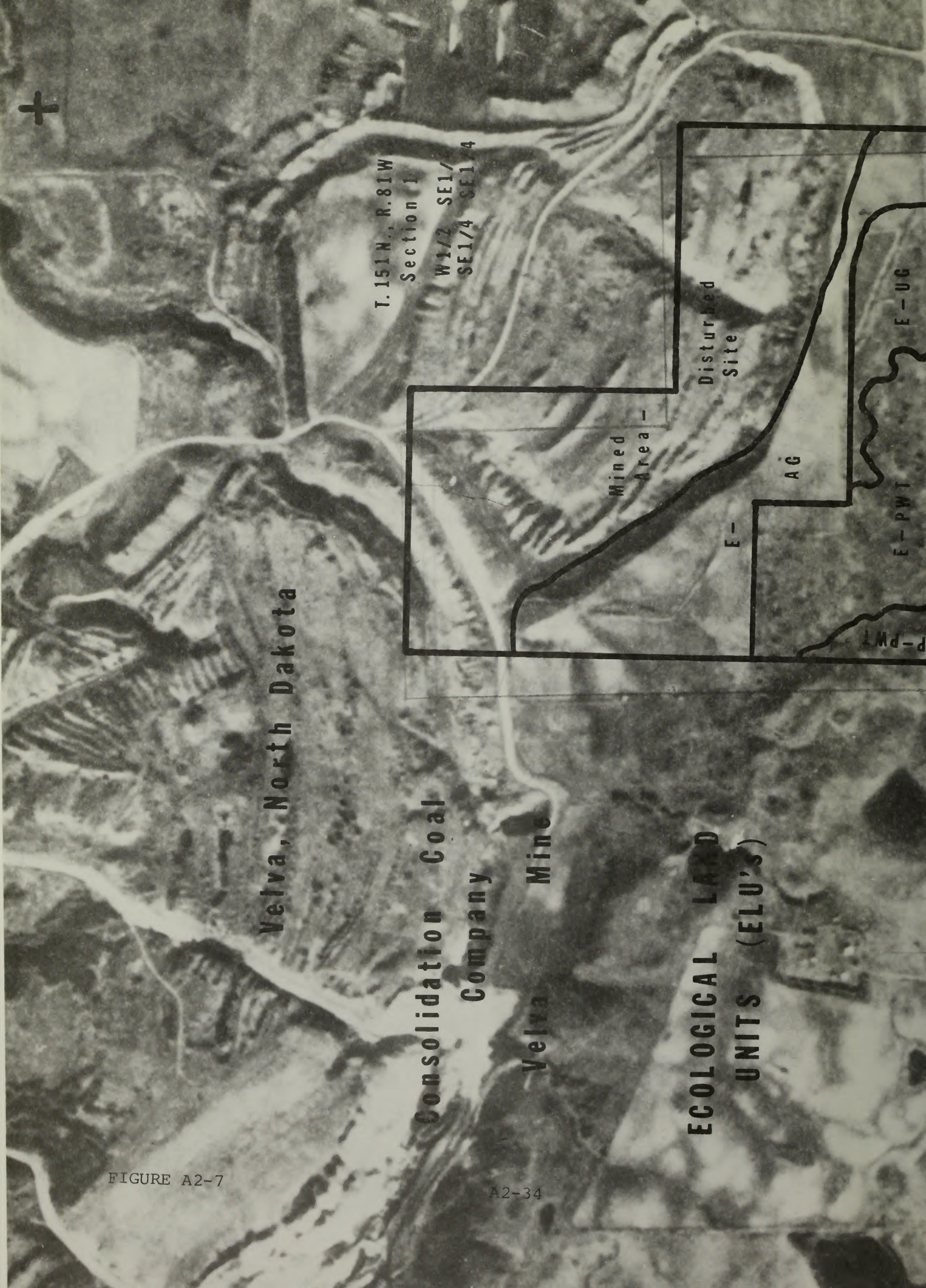
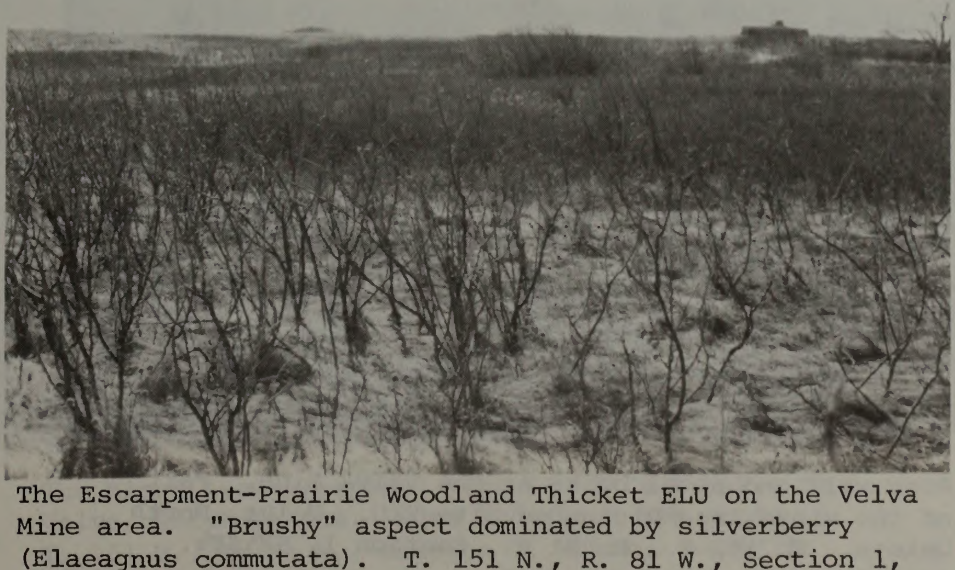
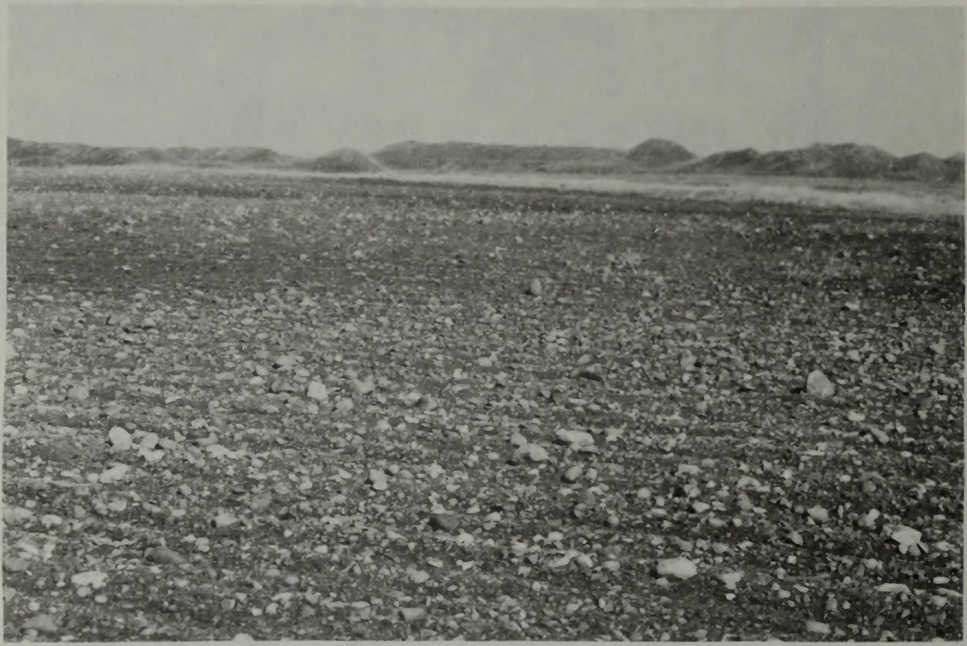

Velva, North Dakota
Consolidation Coal Company
Velva Mine
ECOLOGICAL LAND UNITS (ELU's)
T.151N., R.81W
Section 1
W1/2 SE1/
SE1/4 SE1/4
Mined Area - Disturbed Site
E-
AG
E-PWT
E-UG
IMd-d

FIGURE A2-7

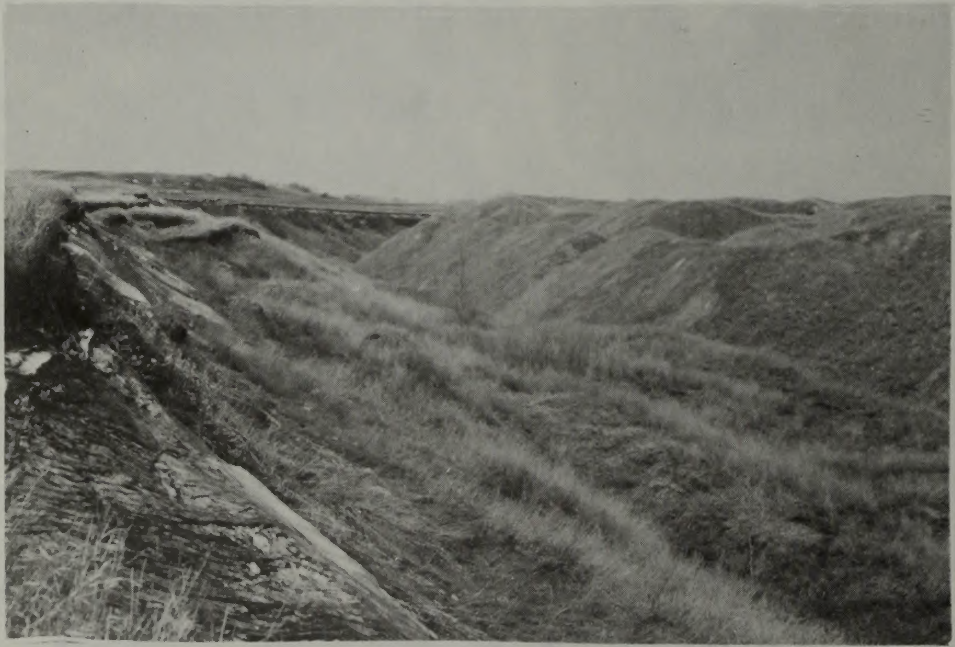
The Escarpment-Prairie Woodland Thicket ELU on the Velva Mine area. "Brushy" aspect dominated by snowberry (Symphoricarpos spp.) and rose (Rosa spp.). T. 151 N., R. 81 W., Section 1, SW¼SE¼. 4/6/76. Viewed looking northwest.



The Escarpment-Prairie Woodland Thicket ELU on the Velva Mine area. "Brushy" aspect dominated by silverberry (Elaeagnus commutata). T. 151 N., R. 81 W., Section 1, SW¼SE¼. 4/6/76. Viewed looking southeast.

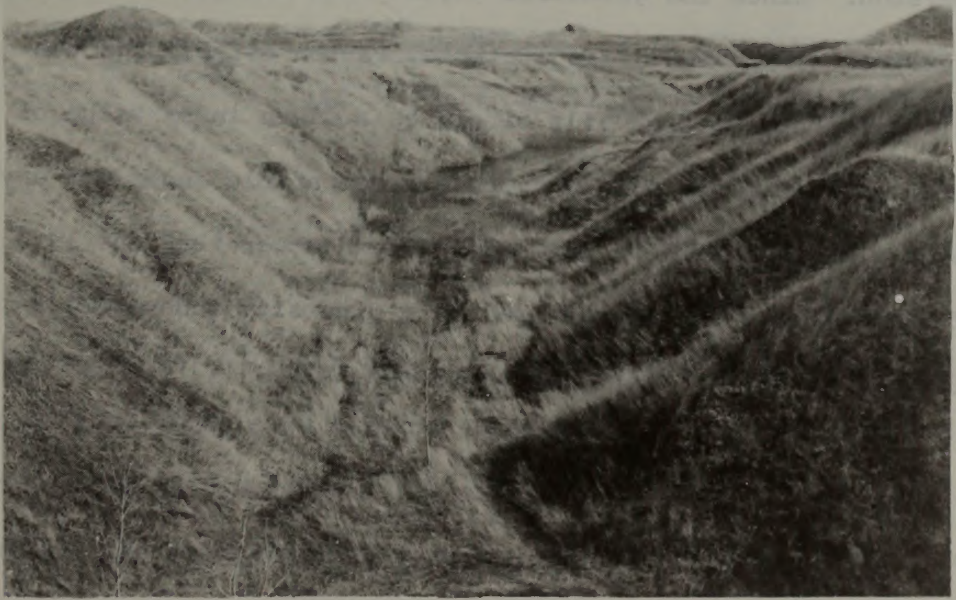


The Escarpment-Agricultural Land ELU on the Velva coal least tract. Fallow field aspect. T. 151 N., R. 81 W., Section 1, SE¼SE¼. Velva, North Dakota. 4/6/76. Viewed looking north.



High wall and spoil banks at the Velva Mine. Part of the Mined Area-Disturbed Site ELU. Velva, North Dakota. T. 151 N., R. 81 W., Section 1, SE¼SE¼. 4/6/76. Viewed looking west.

The Mined Area-Disturbed Site ELU on the Velva Mine area. Velva, North Dakota. Note the relatively heavy vegetative cover. T. 151 N., R. 81 W., Section 1, NE¼SE¼. 4/6/76. Viewed looking southwest.



The Mined Area-Disturbed Site ELU at the Velva Mine. Velva, North Dakota. Note the final pit pond. T. 151 N., R. 81 W., Section 1, NE¼SE¼. 4/6/76. Viewed looking northeast.

APPENDIX 2

Diversity Index

Diversity is the quality, or state, of "being different" or "varied." Diversity of habitats in an ecosystem is generally a desirable characteristic since a wide variety of habitats provides a wide variety of "niches," and a wide variety of "niches" supports a diversified plant and animal community. For any single species, an optimum mixture of habitat components also exists. Leopold (1933) related to habitat diverstiy in terms of "edge-effect" in his Law of Interspersion for game populations. He stated, "The potential density of game of low radius requiring two or more types is, within ordinary limits, proportional to the sum of the type peripheries."

Patton (1975) developed a quantitative expression of Leopold's Law of Interspersion. Since the geometric figure with the greatest area and the least perimeter, or "edge," is a circle, Patton established the ratio of circumference to area of a circle as a given index value of one. He then derived a formula to compute a comparable index for any area to compare with a circle. Any index value larger than one is a measure of irregularity and can be used as a diversity index (DI). Patton's formula to set the ratio equal to one is:

$$\frac{C}{2\sqrt{A \cdot \pi}} = 1$$

where C is the circumference, A is the area, and π is 3.1416. The next step is to restate the formula for habitat diversity as:

$$DI = \frac{TP}{2\sqrt{A \cdot \pi}}$$

where TP is the total perimeter around the area plus any linear edge within the area.

The ELU's of the proposed Velva coal lease tract (Appendix 2, Page A2-34) were utilized to develop a diversity index for the entire tract. Linear distance around the area and each ELU were determined with a map measurer. The calculations were as follows:

Lease Tract:

$$DI = \frac{18{,}957 \text{ ft}}{2\sqrt{(43560 \text{ ft}^2/\text{acre})\ (120 \text{ acres})\ (3.1416)}}$$

$$= 2.34 \text{ (5 ELU's) (120 acres)}$$

This calculation indicates that, in terms of ELU's, the proposed lease tract is 2.34 times more diverse (contains more "edge") than a circle. Knowning this fact provides, insight to, and a comparative standard for, evaluating the relative environmental impacts of mining coal under the proposed lease tract, as well as providing a basis for assigning impact ratings. This fact also alludes to the complexity of assuring adequate reclamation for the lease tract if the coal is mined.

APPENDIX 2

ARCHAEOLOGICAL-HISTORICAL SUMMARY

The State Historical Society of North Dakota's archaeological inventory of the Velva vicinity includes reports of open Indian campsites, stone circle sites, stone cairns, and a few burials. However, there is not yet enough data available to allow a detailed description of how the area was used by prehistoric peoples (Personal Communication, Nick Franke).

The cultures of the Middle Missouri subarea, which includes most of the Missouri Valley in the Dakotas have been described by periods, during which certain cultural trails were dominant. The most diagnostic of these traits are a group of projectile points (spear heads) called Clovis, Folsom, and Plano. Other traits common to the period include sites where large animals were killed and slaughtered; artifact assemblages which indicate the processing of game; and some indicators of plant use such as grinding tools. The Paleo-Indian Period existed roughly between 11,000 B.C. and 6000 B.C. (Lehmer, 1971).

A projectile point which may date to the Paleo-Indian Period was found at the Medicine Crow Site north of the White River in South Dakota. This single artifact is scant evidence of man's presence in the Middle Missouri valley during the period. However, the geologic history of the Dakotas may explain why so little has been found of man's activities. When the last great ice sheet receded from the region, many valleys were cut into the landscape, perhaps destroying much of the evidence for Paleo-Indian occupation (Ibid).

There are few known sites in the Middle Missouri valley which appear to date between 6000 and 500 B.C., the Forager Period. In the Missouri River's Big Bend of South Dakota, some sites have yielded projectile points of the McKean Complex, which are typical of this period. However, the Missouri trench is on the eastern edge of Northwestern Plains subarea, where most of the Forager sites have been located (Ibid).

The traits which characterize the Forager Period include smaller, more crudely made projectile points than were present in Paleo-Indian times; milling stones, which indicate increased reliance on plant food; and new techniques for taking game. Like those who preceded them, the people of the Forager Period were organized into small nomadic bands whose only means of travel was by foot.

Related to the Woodland cultures of the eastern United States, cultures of the Plains Woodland Period introduced new traits to the area between 500 B.C. and 1 A.D. Pottery was made for the first time on the Plains during this period. Although evidence for corn growing in the Middle Missouri at this time is scant, the Woodland cultures probably practiced horticulture in addition to using the plants and game of the wooded bottom lands, and bison from the adjacent plains. Woodland sites contain a few shells from the Pacific Coast and Gulf Coast, indicating that trade was practiced (Ibid.). Mound building was another cultural trait introduced by peoples of this period. Just why these earth mounds were built is not completely understood, however, some of them were cemeteries, indicating elaborate religious or ceremonial practices (Wood and Johnson, 1973).

Many mounds have been recorded on the Middle Missouri and in eastern North Dakota near Devil's Lake and the James River (Chomko and Wood, 1973). Others were constructed in Manitoba near the confluence of Antler River and the Souris River. The relationships among the people who built these earth works are poorly understood. Some mounds in the Middle Missouri appear to have been made during the Plains Woodland Period (500 A.D. to 1000 A.D.), while in other areas, Woodland people may have constructed them or they may have been built much later (1750 A.D. to 1800 A.D.) by the historic Assiniboine Indians (Ibid.).

The lease application lands lie in the area between the Middle Missouri mound groups and those on the Antler River. While no mounds are recorded in this intermediate area, future investigation may reveal Woodland sites in the Missouri Coteau. Such research will no doubt help solve some of the regional problems of prehistory such as the mound affiliations.

In the Middle Missouri subarea, between 900 and 1000 A.D., the Woodland Complexes were replaced by cultures of the Plains Village Period. At this time, traits included villages constructed of post and pole framed, earth covered houses which were fairly permanent dwellings; pottery of various styles; and implements for agriculture such as the scapula (shoulder blade) hoe used to cultivate corn, beans, and squash (Lehmer, 1971). The earliest of these village people probably came from southwestern Minnesota, moving into the Missouri Valley in South Dakota after 900 A.D. A similar group settled to the north after 1100 A.D. Migrating from the Missouri Valley of Nebraska and Kansas, a third culture of village dwellers settled below the initial South Dakota Villages. These people entered the area about 1400 A.D. Finally, between 1550 and 1675 A.D., there was a mixing of traits among these cultures until they became almost identical (Ibid.).

From about 1100 to 1770 A.D., the Plains Village peoples claimed land for some distances on both sides of the Missouri River as hunting territory. The area of the Velva Mine probably lies in the region claimed by the early villagers and their descendents, the Mandan and Hidatsa Indians. (Personal Communication, Nick Franke).

During the 17th century, Plains Village culture began changing under the influence of Europeans in North America. The French began a system of fur trade along the St. Lawrence River which used Indians as middlemen. While traders remained at posts near Quebec, Indians used the goods obtained from the posts to barter for furs farther west. Pelts were then brought to the traders and exchanged for the white man's guns, blankets, and tools. The British Hudson's Bay Company joined in this trade network, establishing posts near James Bay and Hudson's Bay.

In the decade before 1650, the Iroquois Indians began a war to establish themselves as the primary middlemen in this fur trade. These Iroquois wars disrupted the old pattern in which the traders did not go into the interior. The French followed by the British, began to move inland along the waterways and tap new fur markets with other Indians after 1650. Thus a new pattern of trade was established with different groups of Indians becoming the middlemen (Ibid.).

A Frenchman, Pierre Gaultier de Varennes, Sieur de la Verendrye, made the first well documented white contact with the Missouri village groups. In 1738, he noted a well established trade pattern in which these Indians were middlemen. The villagers of the Mandan and Hidatsa Tribes in North Dakota received trade goods from the Hudson's Bay posts in Canada through the Cree and Assiniboine Indians, while the Arikara villages of the South Dakota Missouri Valley received trade goods through the Sioux. Northern and eastern groups, like the Assiniboine and Sioux, got trade goods from posts in Canada and the Western Great Lakes region to barter with the village peoples for their horticultural products and for goods obtained by the villagers from Indians west of the Missouri. From the Crow, Cheyenne and other western groups, who had acquired horses in the first half of the 18th Century, the village people obtained leather goods, meat, and horses for guns and other items. The villagers then traded horses to the eastern Indians for more European goods.

The lease application lands are in the region traversed by the Cree and Assiniboine to trade with the village people. Later in the 18th Century, white traders and trappers used the same route. In the fall of 1797, David Thompson of the British Northwest Fur Company followed this route from the north shore of Lake Superior to the Mandan Villages. The David Thompson State Historic Site, located 20 miles northwest of the Velva Mine, commemorates the visit of this famous geographer, explorer, and trader to the Souris River area. Thompson was the first to map the region (Howard, 1963).

A few years later, when the Lewis and Clark Expedition ventured through the Missouri Valley of the Dakotas from 1804-1806, most of the Europeans in the area were tenant traders. The tenant traders lived in Indian villages rather than posts and operated as small scale middlemen. There were also a few men who represented organized trade and some independent or free-traders who occupied the Indian villages temporarily to exchange fair amounts of trade goods for furs.

Lewis and Clark noted the Indian trade system in their journals. While they wintered near the Mandan and Hidatsa villages at the mouth of the Knife River, several parties of Assiniboine came from the Souris River country to trade with the villagers. They stated that while the Assiniboine and Mandan stole horses from one another, the Mandan did not harass the former too much for fear they may cut off their supply of European goods (Lewis, 1961).

By this time, the strong position of the Missouri villagers was declining. An epidemic disease, perhaps smallpox, severely reduced their number in 1780-81. In 1804, much of the area east and west of the Missouri River was hard for the Mandan and Hidatsa to control. The Assiniboine now roamed freely near the Souris River, while the Sioux controlled much of the area east of the Missouri. Another epidemic in 1837-38 wiped out 60% of the remaining villagers and by 1850, the Sioux were easily killing hunting parties of villagers and stealing their horses (Mattison, 1955).

After the Lewis and Clark Expedition was completed in 1806, the organized traders expanded their posts into the Middle Missouri and beyond. They carried their trade directly to the migratory hunters of the Northwestern Plains. Thus, the village Indians lost their role as brokers in the trade system, a factor which contributed to the decline of the Mandan, Hidatsa, and Arikara (Lehmer, 1971).

The fur trade enjoyed prosperity until after 1840. But business gradually declined as the market was affected by the use of silk instead of beaver pelts for hat manufacture. By 1860, with increased hostility of Sioux Indians in the Lower Yellowstone and Upper Missouri Country, the trade was nearing its end.

During the following decade, steamboat traffic, initiated in 1832 by the American Fur Company, increased in response to the Montana gold rush and resulting immigration. The Missouri became the major transportation route in the area, until the railroads were completed. Even after the Northern Pacific reached Bismarck, North Dakota in 1873, the Upper Missouri to Fort Benton was still serviced by steamboat. Delayed by financial problems and the Sioux wars of the 1870's, the N. P. Railroad was not completed until 1883. When the transcontinental link was made by the railroad, the era of Missouri River steamboat commerce ended.

Completion of the railroads and defeat of the warring Indians opened the way for the settlement of North Dakota. Between 1878 and 1886, the eastern part of the state was populated during the Great Dakota Boom. Economic reversals and inclement weather created a depression and halted settlement efforts until 1898. Major settlement of the western part of the state and the Middle Missouri occurred between 1898 and 1918 (Leppart, 1975). The majority of settlers were 19th Century European immigrants who responded to American railroad and land company recruiting efforts overseas. The immigrants tended to live in distinct ethnic groups which led to block settlement patterns.

TABLE A2-6

1974 INVENTORY OF NORTH DAKOTA OUTDOOR RECREATION FACILITIES

STATE OUTDOOR RECREATION AGENCY, 900 EAST BOULEVARD, BISMARCK, NORTH DAKOTA 58505 701/224-2430

WARD COUNTY					FISHING					SWIMMING			TRAILS			CAMPING				PICNICKING			GOLFING				COURTS					RANGES		RODEOS		DRAMAS, CONCERTS		WINTER SPORTS								RACING			
NAME OF AREA	LOCATION	OWNERSHIP	TOTAL ACRES	SURFACE WATER ACRES	FISHING ACRES	RAMPS	DOCKS	BOATING, WATER SKIING ACRES	HUNTING ACRES	BEACHES	POOLS	POOL AREA (SQ FT)	HIKING, HORSEBACK MILES	BICYCLE MILES	MOTORCYCLE, SNOW MOBILE MILES	ACRES	TENT SITES	TRAILER SITES	ELECTRIC OUTLETS	ACRES	TABLES	SHELTERS	ACRES	GRASS GREENS	SAND GREENS	DIAMONDS BASEBALL AND SOFTBALL	HORSESHOE	VOLLEY BALL	BASKETBALL	TENNIS	PLAYGROUNDS	TRAP, SKEET	ARCHERY	ARENAS	SEATING	AMPHITHEATERS	SEATING	ICE SKATING RINKS	SLEDDING AREAS	SLEDDING ACRES	HOCKEY RINKS	WARMING HOUSES	SKI RUNS	SKI TOWS	VERTICAL RISE (No FEET)	CAR, MOTORCYCLE (No MILES)	SNOWMOBILE (No MILES)	SEATING	REMARKS
Makoti Park	City	M	5								1					1	5	2		2	3	1							1	1	1							1											
Surrey Park Area	City	M	2																							1																							
Sawyer City Park	City	M	5																	3	10					1																							
Berthold City Park	City	M	3																	1	6					1	2			1								1											
Old Settlers Park	2-155-84	C	50	10	10					1						5	12	12	12	5	30	1																											
Carpio Park	City	M	5																	3	4					1																							
Kenmare City Park	City	M	10								1									8	52					2	2		1	2			1					1											
Kenmare Golf Course	City	M	120																				120		9																								
Des Lacs Ball Field	City	M	2																							1																							
Donnybrook Park	City	M	10																	1	2					1																							?
Minot Parks	City	M	325								2					20	40	50		30	400		169	18		7	18			14	7							12			3	6							
KOA Campground	Minot	P-PR	9													7	20	45	32	2	20																												
[illegible] Motel & Campground	Minot	P-PR	5													5	12	12	12																														
Boy Scout Camp	Minot	P-NP	15																	15	20																												
Minot Gun Club	Minot	P-NP	160																													1																	
Velva Sportsman Dam	7 mi. W. of Velva	P	30	7	7																																												
Nelson-Carlson Lake	6-151-84	C	100	80	80		1			1																																							
Rice Lake	3-152-85	C	400	185	185	5	15	185																																									
Des Lacs Railroad Dam	11-155-85	M	55	50	50					1										2	1																												
Lake Darling (N-R)	County	F	6,418	2449	2038	1		2038																																									
Minot Archery Club	Minot	P-NP	20																														1																
Foxholm GMA	25-157-85	S	40						40																																								
FWS WPA's (26)	County	F	4,353						4,353																																								
BLM areas (10)	County	F	265						265																																								
Race Club & Fairgrounds	Minot	P-PR	20																																											1		3000	
TOTAL			12,427	2,781	2,370	6	16	[illegible]	4,658	3	4					38	89	121	56	72	565	2	289	18	9	15	22		2	18	8	1	2					15			3	6				1		3000	

FWS — U.S. FISH AND WILDLIFE SERVICE
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WPA — WATERFOWL PRODUCTION AREA
GMA — GAME MANAGEMENT AREA
MA — MANAGEMENT AREA
PR — OPERATED FOR PROFIT
NP — NON-PROFIT
F,M,C,S — FEDERAL, MUNICIPAL, COUNTY OR STATE
P — PRIVATELY OWNED

Table - Courtesy of the North Dakota State Outdoor Recreation Agency.

TABLE A2-7

1974 INVENTORY OF NORTH DAKOTA OUTDOOR RECREATION FACILITIES

STATE OUTDOOR RECREATION AGENCY, 900 EAST BOULEVARD, BISMARCK, NORTH DAKOTA 58505 701/224-2430

MOUNTRAIL COUNTY

NAME OF AREA	LOCATION	OWNERSHIP	TOTAL ACRES	SURFACE WATER ACRES	FISHING ACRES	RAMPS	DOCKS	BOATING, WATER SKIING ACRES	HUNTING ACRES	BEACHES	POOLS	POOL AREA (SQ FT)	HIKING, HORSEBACK MILES	BICYCLE MILES	MOTORCYCLE, SNOWMOBILE MILES	ACRES	TENT SITES	TRAILER SITES	ELECTRIC OUTLETS	ACRES	TABLES	SHELTERS	ACRES	GRASS GREENS	SAND GREENS	DIAMONDS BASEBALL AND SOFTBALL	HORSESHOE	VOLLEY BALL	BASKETBALL	TENNIS	PLAYGROUNDS	TRAP, SKEET	ARCHERY	ARENAS	SEATING	AMPHITHEATERS	SEATING	ICE SKATING RINKS	SLEDDING AREAS	SLEDDING ACRES	HOCKEY RINKS	WARMING HOUSES	SKI RUNS	SKI TOWS	VERTICAL RISE (No. FEET)	CAR, MOTORCYCLE (No. MILES)	SNOWMOBILE (No. MILES)	SEATING	REMARKS
					FISHING					SWIMMING			TRAILS			CAMPING				PICNICKING			GOLFING				COURTS					RANGES		RODEOS		DRAMAS, CONCERTS		WINTER SPORTS								RACING			
Sikes Dam	16-154-91	P	840	640	640																																												
Pevison Dam	13-152-89	S	52	12	12																																												
Parshall Mine Dam	36-152-90	S&M	19	4	4																																												
Stanley Golf Course	Stanley	P	100																				100		9																								
Rodeo Grounds	White Earth	P	160																															1	750														
Sikes Dam Boy Scout Camp	6-157-93	P	300	150	150	2		150		1						2	5			50	5	5																											
Athletic Field	Stanley	Sch.	6																							1																							
Athletic Field	New Town	Sch.	3																							1																							
Athletic Field	Parshall	Sch.	2																							1																							
Fairgrounds (4-H)	Stanley	C	30																															1	500											.5	1		
Rodeo Grounds	New Town	P	4																															1	3000														
Golf Course	Parshall	P	80																				80		9																								
Rodeo Grounds	Blaisdell	P	5																															1	200														
Clear Water Lake Rec. Area	22-157-90	C	100	90	90					1						20		25		20	8	5																											
Plaza Park	Plaza	M	3																	3	4										2																		
Parshall Park	Parshall	M	49								1					5	12	12	3	5	6					1					2							1				1							
Stanley Park	Stanley	M	28								1					5		20	20	6	12	4				2			1	1	5							1				1							
New Town Park	New Town	M	2								1									2	6	2				1				1	5																		
Plaza Archery	Plaza	M	3																														1																
FWS WPA'S (35)	County	F	6,050						6,050																																								
BLM Areas (37)	County	F	1,346						1,348																																								
Jerome King Resort	Stanley	P-PR	125	100	100																																												
Palermo GMA	21-156-90	S	40						40																																								
Van Hook GMA	R91-T152	S	4,014						4,014																																								
White Earth Valley GMA	31-158-94	S	280	174	174				280																																								
Lake Sakakawea - total *	County	F	95,830	95630	67081			67081																																									
Parshall Bay	Parshall	F	55	*	*			*		1										4	3																												
Van Hook Recreation Area	32-152-91	F-C	12	*	*	1		*		1						12		40		12	12																												
TOTAL			[illegible]	[illegible]	[illegible]	3		[illegible]	[illegible]	4	3					44	17	97	23	102	56	16	[illegible]		18	7			1	2	14		1	4	[illegible]			2				2				.5	1		

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P — PRIVATELY OWNED

Table - Courtesy of the North Dakota State Outdoor Recreation Agency.

TABLE A2-8

1974 INVENTORY OF NORTH DAKOTA OUTDOOR RECREATION FACILITIES

STATE OUTDOOR RECREATION AGENCY, 900 EAST BOULEVARD, BISMARCK, NORTH DAKOTA 58505 701/224-2430

MCLEAN COUNTY

NAME OF AREA	LOCATION	OWNERSHIP	TOTAL ACRES	SURFACE WATER ACRES	FISHING ACRES	RAMPS	DOCKS	BOATING, WATER SKIING ACRES	HUNTING ACRES	BEACHES	POOLS	POOL AREA (SQ FT.)	HIKING, HORSEBACK MILES	BICYCLE MILES	MOTORCYCLE, SNOW MOBILE MILES	ACRES	TENT SITES	TRAILER SITES	ELECTRIC OUTLETS	ACRES	TABLES	SHELTERS	ACRES	GRASS GREENS	SAND GREENS	DIAMONDS-BASEBALL AND SOFTBALL	HORSESHOE	VOLLEY BALL	BASKETBALL	TENNIS	PLAYGROUNDS	TRAP, SKEET	ARCHERY	ARENAS	SEATING	AMPHITHEATERS	SEATING	ICE SKATING RINKS	SLEDDING AREAS	SLEDDING ACRES	HOCKEY RINKS	WARMING HOUSES	SKI RUNS	SKI TOWS	VERTICAL RISE (No. FEET)	CAR, MOTORCYCLE (No. MILES)	SNOWMOBILE (No. MILES)	SEATING	REMARKS
				FISHING						SWIMMING			TRAILS			CAMPING				PICNICKING			GOLFING				COURTS					RANGES		RODEOS		DRAMAS, CONCERTS		WINTER SPORTS								RACING			
Lake Sakakawea - total *	County	F	82,595	82595	54457			54457																																									
Douglas Creek Recreation Are	148-86-28	F	600	*	*	1		*		1											2																												
Garrison Bible Camp	S. of City	P	25	*	*	1	1	*												2	6							1	2																				
Lee's Resort	S.of Garrison	P	20	*	*	2		*								6	15	15	15	6	15																												
YMCA Camp	S.of Garrison	P	320	*	*								10			8	10	5																															
Lutheran Bible Camp	S.of Garrison	P	80	*	*											8	10	10																															
Ft. Stevenson State Park	3mi.S. "	F/S	438	*	*	1	2	*								4	10	10		5	23																												
Totten Trail Public Use Area	Lake Audubon	F	116	*	*	1				1						30	20			10	13																												
Wolf Creek Public Use Area	E.of Riverdale	P	40	*	*	1		*		1										5	20	4																											
Deep Water Creek GMA	7mi.W.Raub	F/S	2,242	*	*	1		*	2,242																																								
Missouri River - total**	County	F	5,253	5253	3677			3677																																									
Washburn Park	City	M	8	**	**	1	1	**												5	12	2							1									2				1							
Western 4-H Camp	144-81	P	87	**	**								3		2					1	20					1	2	1	2			1															4		
Downstream Recreation Area	3mi. SW of Riverdale	F	502	**	**								3		1	8		60	60																														
Lewis & Clark Historic Site	W.of Washburn	C	10																	5	3	1																											
Lake Nettie	148-81	C	150	140	140					1																																							
Riverdale	City	F	5																							1																							
Garrison Park	City	M	1																	1	12	2																											
Underwood Golf Course	City	P	60																				60		9																								
Garrison Golf Course	City	P	80																				60		9																								
Underwood Park	City	M	1																	1	12										1																		
Garrison Swimming Pool	City	M	1								1																																						
Washburn Swimming Pool	City	M	1								1																																						
Wilton Park	City	M	11																	3	4																												
Conklin Dam	149-85-25	S-C	82	62	62																																												
Yanktonai Dam, Wilton	143-80-30	S-P	80	32	32																																												
Blue Lake	147-79-16	S-P	400	400	400					1										1	2																									1			
Brush Lake Recreation Area	147-79-27	S-P	320	200	200	1	2			1										20	10	2																											
Crooked Lake, Turtle Lake	148-80-8	S-P	375	375	375					1																																							
Strawberry Lake, Ruso	149-80-2	S-P	260	140	140	1	5	140		1																																							
Turtle Lake Park	City	M	10																	2	5	1																											
Riverdale Overlook Picnic	Riverdale	F	10																	10	12	2																											
City of Butte	City	M	1																	1	7					1																							

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Table - Courtesy of the North Dakota State Outdoor Recreation Agency.

VISUAL QUALITY RATINGS

Any rating of visual quality is highly subjective. In order to achieve a relatively objective rating the following procedures (adapted from BLM Manual 6310) were used.

1. The rating area (the Souris River Basin) was compared to the region identified as the "Dakota-Minnesota Drift" by the Northern Great Plains Resources Program (1974). This region includes the portion of North Dakota lying north and east of the Missouri escarpment.
2. Key factors (see Figure A2-8) of scenery were applied to the area separately. Each key factor applied to the area as a whole, not from any one location or even from a bird's-eye view.
3. Four individuals with differing backgrounds rated the area independently. The raters were familiar with the scenery of the area and region and with the concepts of this rating system. The rating results are shown in Figure A2-9.

The area received a summary rating of 8 out of a possible 24. This rating reasonably reflects the area's scenic quality. Landform is gentle. Colors are generally muted and are most pronounced in the fall as a result of seasonal vegetative changes.

The Souris River and associated lakes and reservoir contribute a water component, but it is not as evident as in other areas within the region. Vegetation is limited to farmlands, intermingled hardwoods and native grasslands. The area is not particularly unique. There are some intrusions, but most are related to the farming activities which characterize the area.

APPENDIX 2

FIGURE A2-8

QUALITY EVALUATION OF RECREATION USE OPPORTUNITIES

Quality Evaluation Chart for Sightseeing - Scenery

Quality Evaluation Chart

SCENERY

KEY FACTORS	RATING CRITERIA AND SCORE		
① LAND FORM	Vertical or near vertical cliffs, spires, highly eroded formations, massive rock outcrops, severe surface variation. 4	Steep canyon walls, mesas, interesting erosional patterns, variety in size & shape of land forms. 2	Rolling hills, foothills, flat valley bottoms. 1
② COLOR	Rich color combinations variety or vivid contrasts in the color of soil, rocks, vegetation or water. 4	Some variety in colors and contrast of the soil, rocks & vegetation, but not dominant. 2	Subtle color variations, little contrast, generally muted tones. Nothing really eye-catching. 1
③ WATER	Still, chance for reflections or cascading white water, a dominant factor in the landscape. 4	Moving and in view or still but not dominant. 2	Absent or present but seldom seen. 1
④ VEGETATION	A harmonious variation in form, texture, pattern, and type. 4	Some variation in pattern and texture, but only one or two major types. 2	Little or no variation, contrast lacking. 1
⑤ UNIQUENESS	One of a kind or very rare within region. 6	Unusual but similar to others within the region. 2	Interesting in its setting, but fairly common within the region. 1
⑥ INTRUSIONS	Free from aesthetically undesirable or discordant sights and influences. 2	Scenic quality is somewhat depreciated by inharmonious intrusions but not so extensive that the scenic qualities are entirely negated. 1	Intrusions are so extensive that scenic qualities are for the most part nullified. -4

A = 15-24   B = 10-14   C = 1-9

EXPLANATION OF RATING CRITERIA

① Land Form or topography becomes more interesting as it gets steeper and more massive. Examples of outstanding land forms are found in Grand Canyon, the Sawtooth Mountain Range in Idaho, the Wrangle Mountain Range in Alaska, Rocky Mountain National Park, etc.

② Color. Consider the overall color of the basic components of the landscape (i.e., soil, rocks, vegetation, etc.) as they appear during the high use season. Key factors to consider in rating "color" are variety, contrast, and harmony.

③ Water is that ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score.

④ Vegetation. Give primary consideration to the variety of patterns, forms, and texture created by the vegetation.

⑤ Uniqueness. This factor provides an opportunity to give added importance to one or all of the scenic features that appear to be relatively unique within any one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is a number of not so spectacular elements in the proper combination that produces the most pleasing scenery -- the uniqueness factor can be used to recognize this type of area and give it the added emphasis it needs.

⑥ Intrusions. Consider the impact of man-made improvements on the aesthetic quality. These intrusions can have a positive or negative aesthetic impact. Rate accordingly.

INSTRUCTIONS (See Sec. .1 for general procedures)

Purpose: To rate the aesthetic quality of the scenic resource on all BLM lands.

How to Identify Scenery Value: All Bureau lands have scenic value.

How to Determine Minimum Suitability: All BLM lands are rated for scenic values. Also rate adjacent or intermingling non-BLM lands.

How to Delineate Rating Areas: Consider the following factors when delineating rating areas:

1. Like physiographic characteristics (i.e., land form, vegetation, etc.
2. Similar visual patterns, texture, color, variety, etc.
3. Areas which have a similar impact from intrusions (i.e., roads, structures, mining operations, or other surface disturbances).

APPENDIX 2
FIGURE A2-9

1. Date 4/22/76
2. Rater
3. State North Dakota
4. District Miles City
5. Plan Unit Oliver-Mercer

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

QUALITY EVALUATION SCORESHEET

6. Recreation Activity

Velva Mine Area
Sightseeing - Scenery

CLASS	SCORE RANGE
	7
A	15-24
B	10-14
C	1-9

8. KEY FACTORS

9. RATING AREA		10. POINT MAXIMUM										
NO. (a)	NAME (b)	Landform	Color	Water	Vegetation	Uniqueness	Intrusions			11. TOTAL SCORE	12. CLASS	13. REMARKS
		4	4	4	4	6	2					
	Rater No. 1	1	1	1	2	1	1					
	Rater No. 2	1	1	1	2	1	1					
	Rater No. 3	1	1	1	2	2	1					
	Rater No. 4	1	2	1	2	2	1					
	Total	4	5	4	8	6	4					
	Average	1	1.25	1	2	1.5	1					
	Summary Rating	1	1	1	2	2	1			8	C	

(Instructions on reverse)

Form 6110-10 (August 1972)

APPENDIX 3

FIGURE A3-1

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ENVIRONMENTAL ANALYSIS WORKSHEET

1. Action

Consolidation Coal Company - Velva Mine, Velva, North Dakota

2. Stages of implementation

Mining

3. DISCRETE OPERATIONS

(Non-Lease) Mine in general / (Lease) Mining of Federal coal

4. COMPONENTS, SUBCOMPONENTS, AND ELEMENTS IMPACTED		5. ANTICIPATED IMPACTS: Soil Removal and Stockpile	Overburden Removal	Blasting, Excavation and Loading	Transportation, Delivery & Crushing		6. REMARKS
I. NONLIVING COMPONENTS	A. AIR						
	Air Movement Patterns	I/I	I/I	O/O	O/O		
	Temperature	I/I	O/O	O/O	O/O		
	Particulate Matter	-L/-L	I/I	I/I	-L/-L		
	Exhaust Emissions	I/I	O/O	I/I	I/I		
	B. LAND						
	Geologic Structure	O/O	-H/-H	-H/-H	O/O		
	Minerals	O/O	O/O	-H/-H	O/O		
	Paleontology	O/O	I/I	O/O	O/O		
	Topography	I/I	-H/-H	I/I	O/O		
	Soil Depth	-L/-L	O/O	O/O	O/O		
	Soil Structure	-H/-H	O/O	O/O	O/O		
	Soil Nutrients	-L/-L	I/I	O/O	O/O		
	Soil Pollutants	+L/+L	O/O	O/O	O/O		
	Soil Erosion	-L/-L	O/O	O/O	O/O		
	C. WATER						
	Hydrologic Cycle	-M/-M	-M/-M	-H/-M	O/O		
	Sediment Load	-H/-H	-L/-L	X/X	O/O		
	Dissolved Solids	-I/-I	I/I	O/O	O/O		
	Chemicals, Heavy metals, Toxic substances	X/X	X/X	X/X	O/O		
	Nutrients	-I/-I	-I/-I	O/O	O/O		
	Solid Debris	O/O	O/O	O/O	O/O		
	Coliform Contamination	O/O	O/O	O/O	O/O		
	Acid Balance	O/O	O/O	O/O	O/O		
	Dissolved Oxygen	-L/-L	I/I	X/X	O/O		
II. LIVING COMPONENTS	A. PLANTS *(Aquatic)*						
	Temperature	I/I	X/X	O/O	O/O		
	Vascular	-L/-I	-I/-I	O/O	O/O		
	Phytoplankton	-L/-I	-I/-I	O/O	O/O		
	Floating	O/O	O/O	O/O	O/O		

(Continued on reverse)

DISCRETE OPERATIONS

(Non-Lease) Mine in general / (Lease) Mining of Federal coal

	COMPONENTS, SUBCOMPONENTS, AND ELEMENTS IMPACTED	Soil Removal and Stockpile	Overburden Removal	Blasting, Excavation and Loading	Transportation, Delivery & Crushing		REMARKS
		ANTICIPATED IMPACTS					
II. LIVING COMPONENTS (Con.)	B. PLANTS *(Terrestrial)*						
	Lichens - Mosses	-H/-H	X/X	O/O	O/O		
	Grasses	-H/-H	-I/-I	O/O	O/O		
	Forbs	-H/-H	-I/-I	O/O	O/O		
	Shrubs	-H/-H	-L/-L	O/O	O/O		
	Broadleaf Trees	-M/-M	-I/-I	O/O	O/O		
	C. ANIMALS *(Aquatic)*						
	Mammals	-L/-L	-I/-I	O/O	O/O		
	Birds	-L/-L	-I/-I	O/O	O/O		
	Amphibians	-M/-M	-I/-I	O/O	O/O		
	Fish	X/X	X/X	O/O	O/O		
	Invertebrates	-M/-M	-I/-I	O/O	O/O		
	Zooplankton	-M/-M	-I/-I	O/O	O/O		
	D. ANIMALS *(Terrestrial)*						
	Mammals	-H/-H	-I/-I	O/O	-I/-I		
	Birds	-H/-H	-I/-I	O/O	O/O		
	Reptiles	-H/-H	-I/-I	O/O	-I/-I		
	Invertebrates	-H/-H	O/O	O/O	O/O		
	Man	-I/-I	-I/-I	-I/-I	-I/-I		
III. INTERRELATIONSHIPS	A. ECOLOGICAL PROCESSES						
	Succession	-H/-H	-L/-L	O/O	O/O		
	Food Relationships	-H/-H	O/O	O/O	O/O		
	Community Relationships	-H/-H	O/O	O/O	O/O		
IV. HUMAN VALUES	A. LANDSCAPE CHARACTER						
	Aesthetics					-L/-L	Cumulative Impact
	B. SOCIOCULTURAL INTERESTS						
	Recreation					-L/-L	Cumulative Impact
	Cultural Resources	X/X	O/O	O/O	O/O		
	Social/Economic Conditions					O/O	Cumulative Impact unknown - possible cancelling values
	Land Use Compatability	-H/+L	-/-	O/O	O/O		
	Land Use Suitability	+H/+H	+M/+M	+M/+M	+H/+H		

INSTRUCTIONS

1. *Action* – Enter action being taken, analytic step for which worksheet is being used, environmental viewpoint of impact, and any assumptions relating to impact.
   a. Worksheet is normally used to analyze *"Anticipated Impacts"* of action; *however*, it may be used to analyze *"Residual Impacts."* Worksheets may also be used to compare impacts before and after mitigating measures are applied.
   b. State viewpoint that best describes environmental impact. For example, a fence viewed down the fence line has greater impact than the same fence viewed over an entire allotment. Generally, narrow viewpoints better illustrate specific impacts than will broad viewpoints.
   c. Assumptions may be made to establish a base for analysis *(e.g. estimated time periods, season of year, etc.)*.

2. *Stages of Implementation* – Identify different phases of proposed project *(e.g. a road project consists of survey, construction, use, and maintenance stages)*.

3. *Discrete Operations* – Identify separate actions comprising a particular stage of implementation *(e.g. the construction stage of the road project has the discrete operations of clearing, grading, and surfacing)*.

4. *Elements Impacted* – Enter under appropriate heading all environmental elements susceptible to impact from action and alternatives. Relevant elements not contained in the digest should also be entered. See BLM Manual 1791, Appendix 2, Environmental Digest.

5. *Anticipated Impact* – Evaluate anticipated impact on each element and place an entry in the appropriate square indicating degree of impact as low (L), medium (M), high (H), no impact (O), or unknown or negligable (X). Preceed each entry by a plus (+) or minus (-) sign indicating a beneficial or adverse type of impact. If type of impact reflects a matter of opinion or is not known, *do not* preceed with a sign. For example, construction of a wind mill on open range has a definite visual impact; *however*, to some people the effect is detrimental while to others it is an improvement. By not entering a plus (+) or minus (-) sign the worksheet is kept factual and unbiased. If both degree and type of impact are unknown, place an (x) in the appropriate square.
   a. The measures of impact *(e.g. low, medium, and high)* are relative and their meaning may vary slightly from action to action. The term *"low"* should not be applied to impacts of a negligible nature. For example, we know that a pickup truck driving down a proposed fence line laying wire has some impact on air quality. However, the significance of this impact is not normally great enough to warrant even a *"low"* rating. In cases like this, the impact will usually be marked "O" or the element left off the worksheet.
   b. It is recognized that some environmental elements may defy accurate measurement or in-depth analysis within current Bureau capabilities or expertise. The nature of the action as well as type and degree of impact should guide in the decision to seek outside expertise or assistance.

6. *Remarks* – Enter clarifying information.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

ENVIRONMENTAL ANALYSIS WORKSHEET

1. Action

Consolidation Coal Company - Velva Mine, Velva, North Dakota

2. Stages of implementation

Mining

3. DISCRETE OPERATIONS

(Non-Lease) Mine in general / (Lease) Mining of Federal coal

	4. COMPONENTS, SUBCOMPONENTS, AND ELEMENTS IMPACTED	5. ANTICIPATED IMPACTS: Regrading	Topsoiling	Revegetation			6. REMARKS
I. NONLIVING COMPONENTS	A. AIR						
	Air Movement Pattern	I/I	0/0	I/I			
	Temperature	0/0	0/0	I/I			
	Particulate Matter	-L/-L	-L/-L	I/I			
	Exhaust Emissions	I/I	I/I	I/I			
	B. LAND						
	Geologic Structure	0/0	0/0	0/0			
	Minerals	0/0	0/0	0/0			
	Paleontology	0/0	0/0	0/0			
	Topography	+M/+M	I/I	0/0			
	Soil Depth	-L/-L	+H/+H	+L/+L			
	Soil Structure	I/I	+H/-H	+L/+L			
	Soil Nutients	I/I	+H/+H	+H/+H			
	Soil Pollutants	X/X	I/I	0/0			
	Soil Erosion	+H/+H	-L/-L	+H/+H			
	C. WATER						
	Hydrologic Cycle	+M/+M	+M/+M	+M/+M			
	Sediment Load	+L/+L	X/X	+H/+H			
	Dissolved Solids	I/I	I/I	+I/+I			
	Chemicals, Heavy metals, Toxic substances	0/0	0/0	X/X			
	Nutrients	0/0	-I/-I	-I/-I			
	Solid Debris	0/0	0/0	0/0			
	Coliform Contamination	0/0	0/0	0/0			
	Acid Balance	0/0	0/0	I/I			
	Dissolved Oxygen	I/I	I/I	X/X			
II. LIVING COMPONENTS	A. PLANTS *(Aquatic)*						
	Temperature	0/0	0/0	X/X			
	Vascular	+I/+I	I/I	X/X			
	Phytoplankton	+I/+I	I/I	0/0			
	Floating	0/0	0/0	0/0			

(Continued on reverse)

Form 1790-3 (June 1974)

DISCRETE OPERATIONS	Regrading	Topsoiling	Revegetation		(Non-Lease) Mine in general (Lease) Mining of Federal coal	
COMPONENTS, SUBCOMPONENTS, AND ELEMENTS IMPACTED	ANTICIPATED IMPACTS					REMARKS
II. LIVING COMPONENTS *(Con.)*						
B. PLANTS *(Terrestrial)*						
Lichens - Mosses	X/X	X/X	O/O			
Grasses	+I/+I	+M/+M	+H/+H			
Forbs	+I/+I	+M/+M	+H/+H			
Shrubs	+I/-I	+M/+M	X/X			
Broadleaf Trees	+I/-I	+I/+I	X/X			
C. ANIMALS *(Aquatic)*						
Mammals	+I/+I	+I/+I	X/X			
Birds	+I/+I	+I/+I	X/X			
Amphibians	+I/+I	+I/+I	+M/+M			
Fish	X/X	X/X	X/X			
Invertebrates	+I/+I	+I/+I	X/X			
Zooplankton	+I/+I	+I/+I	X/X			
D. ANIMALS *(Terrestrial)*						
Mammals	+I/+I	+L/+L	+H/+H			
Birds	+I/+I	+L/+L	+H/+H			
Reptiles	+I/+I	+L/+L	+H/+H			
Invertebrates	O/O	+M/+M	+H/+H			
Man	+I/+I	+I/+I	+I/+I			
III. INTERRELATIONSHIPS						
A. ECOLOGICAL PROCESSES						
Succession	X/X	+H/+H	+H/+H			
Food Relationships	O/O	+M/+M	+H/+H			
Community Relationships	O/O	+M/+M	+H/+H			
IV. HUMAN VALUES						
A. LANDSCAPE CHARACTER						
Aesthetics					+L/+L	Cumulative Impact
B. SOCIOCULTURAL INTERESTS						
Recreation					+L/+L	Cumulative Impact
Cultural Resources	O/O	O/O	O/O			
Social/Economic Conditions					O/O	Cumulative Impact unknown - possible cancelling values
Land Use Compatability	+/+	+H/+H	+H/+H			
Land Use Suitability	+H/+H	+H/+H	+H/+H			

INSTRUCTIONS

1. *Action* — Enter action being taken, analytic step for which worksheet is being used, environmental viewpoint of impact, and any assumptions relating to impact.
    a. Worksheet is normally used to analyze *"Anticipated Impacts"* of action; *however*, it may be used to analyze *"Residual Impacts."* Worksheets may also be used to compare impacts before and after mitigating measures are applied.
    b. State viewpoint that best describes environmental impact. For example, a fence viewed down the fence line has greater impact than the same fence viewed over an entire allotment. Generally, narrow viewpoints better illustrate specific impacts than will broad viewpoints.
    c. Assumptions may be made to establish a base for analysis *(e.g. estimated time periods, season of year, etc.)*.
2. *Stages of Implementation* — Identify different phases of proposed project *(e.g. a road project consists of survey, construction, use, and maintenance stages)*.
3. *Discrete Operations* — Identify separate actions comprising a particular stage of implementation *(e.g. the construction stage of the road project has the discrete operations of clearing, grading, and surfacing)*.
4. *Elements Impacted* — Enter under appropriate heading all environmental elements susceptible to impact from action and alternatives. Relevant elements not contained in the digest should also be entered. See BLM Manual 1791, Appendix 2, Environmental Digest.
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    b. It is recognized that some environmental elements may defy accurate measurement or in-depth analysis within current Bureau capabilities or expertise. The nature of the action as well as type and degree of impact should guide in the decision to seek outside expertise or assistance.
6. *Remarks* — Enter clarifying information.

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APPENDIX 3

Definitions of Impact Rating Terms Applied to Vegetation and Wildlife During This Analysis*

Impact Rating Term	Definitions
High Positive	Increase in parametric value of 50 percent or more; should be confirmable within 3 years.
Moderate Positive	Increase in parametric value of 25 to 50 percent; should be confirmable within 3 to 10 years.
Low Positive	Increase in parametric value of 10 to 25 percent; not usually confirmable within 10 years.
No Change (Insignificant)	Increase or decrease in parametric value of less than 10 percent; not confirmable within useful period of time.
Low Negative	Decrease in parametric value of 10 to 25 percent; not usually confirmable within 10 years.
Moderate Negative	Decrease in parametric value of 25 to 50 percent; should be confirmable within 3 to 10 years.
High Negative	Decrease in parametric value of 50 percent or more; should be confirmable within 3 years.

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*Wildlife was considered by major component category (see analysis worksheets). Adapted from "Oil Shale Development and Wildlife in Northwestern Colorado," by L. W. Carlson and A. T. Cringan dated 1975. Wildlife Society Bulletin Vol. 3(1).

APPENDIX 3

ANALYSIS OF IMPACTS - ELU's

In an attempt to reflect the significance of the changes in the environment following mining, each of the natural ELU's within the proposed lease tract was rated by basic components of the environment. The rating in Table A3-1 was done by the analysis team. The ELU components were rated from zero to three depending on relative value to that ELU. Zero represents no value and three represents the highest. All component ratings were totaled, thus establishing an arbitrary Base Level Value for each ELU.

TABLE A3-1

BASE LEVEL VALUES

ELU	Air	Soils	Water	Plants	Animals	← HUMAN VALUES →		Base Level Value
						Economic	Non-Economic	
P-PWT	2	1	2	3	3	1	2	14
E-PWT	2	1	2	3	3	1	3	15
E-UG	2	2	1	2	2	2	1	12
E-AG	2	2	1	1	1	3	1	11
	8	6	6	9	9	7	7	

Table A3-2 reflects the relative change in each ELU with mining and reclamation. With each step in mining the value destroyed was subtracted from the Base Level Value. The numerical value subtracted is modified by the area of that ELU which would be mined. In reclamation, the replaced values were numerically added. The total after reclamation was compared with the Base Level Value. The Residual Difference shows the total resource difference between the reclaimed and natural ELU's. This comparison is subjective and arbitrary, but it suggests the difference between pre-mining and post-reclamation activities. It demonstrates numerically that reclamation cannot restore all resource values.

TABLE A3-2

RESIDUAL DIFFERENCE

Discrete Operations	P-PWT	E-PWT	E-UG	E-AG
Base Level Value	14	15	12	11
Topsoil Removal	unmined type	-6	-7	-8
Overburden Removal		-1	-1	-1
Excavation		0	0	0
Transportation and Crushing		0	0	0
TOTAL	14	-7	-8	-9
Regrading	unmined	+1	+1	+1
Topsoiling		+2	+3	+7
Revegetation		+1	+3	+1
TOTAL	14	+4	+7	+9
Residual Difference (±)	0	-3	-1	0

APPENDIX 4

APPENDIX 4

Criteria for Nominating Sites of State, National, or Local Significance to the National Register of Historic Places

The criteria applied to evaluate properties for possible inclusion in the National Register are listed below. The criteria shall be used in evaluating properties for nomination to the National Register, by the National Park Service in reviewing nominations, and for evaluating National Register eligibility of properties affected by federal agency undertakings.

National Register Criteria for Evaluation. The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and

(a) That are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) That are associated with the lives of persons significant in our past; or

(c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) That have yielded, or may be likely to yield, information important in prehistory or history.

Criteria Considerations. Ordinarily cemeteries, birthplaces, or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

(a) A religious property deriving primary significance from architectural or artistic distinction or historical importance.

(b) A building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event.

(c) A birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building directly associated with his productive life.

(d) A cemetery which derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events.

(e) A reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived.

(f) A property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own historical significance.

(g) A property achieving significance within the past 50 years if it is of exceptional importance.

(d) that have yielded, or may be likely to yield, information important in prehistory or history. [illegible]

Criteria considerations. Ordinarily cemeteries, birthplaces, or graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

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(e) A reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration

APPENDIX 5

GLOSSARY

A1 horizon - The surface layer of soil.

A2 horizon - A light colored leached or bleached soil layer that sometimes occurs just below the A1 horizon.

alkaline soil - A soil that has either so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or higher), or both, that the growth of most plants is reduced.

alluvium - Clay, silt, sand, gravel, or other rock materials transported by flowing water and deposited in comparatively recent geologic time as sorted or semisorted sediments in riverbeds, estuaries, and flood plains, on lakes, shores, and in fans.

aquifer - Layers, stringers and pockets of material beneath the land surface saturated with water.

artesian well - Water in a well rising as a result of natural pressure. Commonly the water flows at the land surface with considerable pressure.

autotrophic - Ecologically speaking, these are "producer" organisms which construct or build organic substances (i.e., green (chlorophyll) plants).

available water capacity - Soil water that is available to plants for growth; 1/3 bar to 15 bars.

B horizon - Subsoil; the soil layer below the A horizon.

biome - A major biotic unit consisting of plant and animal communities having similarities in form and environmental conditions.

biotic - Anything being of, or related to life, or having a specified mode of life.

box cut - The initial cut driven in a property, where no open side exists; this results in a highwall on both sides of the cut.

C horizon - Substratum; the soil layer below the B horizon; may be parent material.

calcareous - Soil containing sufficient free calcium carbonate to effervesce (bubble) visibly when treated with cold 0.1 N Hydrochloric acid.

calcium carbonate - $CaCO_3$; limestone, calcite, etc.

calcium sulfate - $CaSO_4$; gypsum, anhydrite, etc.

capability class - Reflects the relative capability of the soil to produce commonly grown crops on a sustained basis, Class I being the best and class VIII the poorest.

carnivore - Flesh eating organism.

cfs - The volume of water represented by the flow of one cubic foot per second.

channery - As used here, "scoria".

climax - The final or mature community in the natural process of succession.

coliform - A group of bacterial micro-organisms commonly found in the intestinal waste from warm-blooded animals. This bacterial group is often used as an indicator of sewage pollution in water supplies.

community - All the populations occupying a given area.

consequent drainage - A stream course controlled by the form and slope of the land surface.

continental climate - Climatic conditions originating over a large land mass.

coulee - A long, narrow, steep sided water channel where water drains.

cropline - A line following the coal outcrop.

cultural resources - The sites, structures, objects, ruins, art work, architectural works, burials, artifacts and other evidences of human endeavor that are still evident on the land.

cultural resource survey - A research oriented inventory of archaeological or historic sites made to gather research data and usually problem oriented.

dead ice moraine - Ablation till.

disclimax - The biotic state when a stable community, which is not the climatic or edaphic climax for the given site, is maintained by man or his domestic animals; disturbance climax.

dragline - A type of excavation equipment which casts a rope-hung bucket a considerable distance, collects the dug material by pulling the bucket toward itself on the ground with a second rope, elevates the bucket, and dumps the material on a spoil bank, in a hopper, or on a pile.

ecosystem - Complex self-sustaining natural system which includes living and non-living components of the environment and the interactions that bind them together. Its functioning involves the circulation of matter and energy between organisms and their environment.

effective rooting depth - The total depth to which plant roots can penetrate the soil without restriction; i.e., claypan, bedrock or water table.

endemic species - Those organisms that are produced, growing, or living naturally in a particular area. Native species.

evaporation - The return of water in a vapor state to the atmosphere.

evapotranspiration - The return of water to the atmosphere by evaporation and transpiration of vegetation.

final cut - The last cut in a strip mine. A highwall will result on one side.

flood plain - The portion of a river valley, adjacent to the river's channel, that is relatively flat and wide and becomes covered with water when the river overflows its banks.

fluvial - Applied to sand and gravel deposits laid down by streams or rivers. Such deposits are of fluvial origin.

food chain - The process of the transfer of food energy from the source in plants through a series of organisms with repeated eating and being eaten.

glacial drift - Boulders, till, gravel, sand, or clay transported by a glacier or its meltwater.

glacial till - Material deposited by glaciation, usually composed of a wide range of particle sizes, which have not been subjected to the sorting action of water.

gpm - The volume of flowing water measured in gallons per minute.

ground moraine - The irregular sheet of till deposited partly beneath the advancing glacier and partly directly from the ice when it melts away.

ground water - Water beneath the land surface.

habitat - A specific set of physical conditions that surround the single species, a group of species, or a large community. For wildlife, the major habitat components are considered to be food, water, cover, and living space. An organism's "home".

head (hydraulic head) - The height of a fluid column, usually considered as water, which maintains a pressure on a surface.

heavy metals - The elemental metallic cations that have the capability of interfering with, or interrupting, the normal physiological processes of organisms when present in excessive quantities. In excessive quantities, these elements (i.e., lead, zinc, mercury, arsenic, etc.) are an environmental pollutant.

herbivore - Plant eating organism.

heterotrophic - Ecologically speaking, these are "consumer" (i.e., mammals) and "reducer" (i.e., fungi) organisms which destroy organic substance.

highwall - The face or bank on the uphill side of a contour strip mine excavation.

hydraulic conductivity - The ability of water to move through subsurface material.

hydrologic cycle - The constant circulation of water from the atmosphere to the land and the subsurface then back to the atmosphere again.

hydrophyte - A plant that grows in water or in wet or saturated soils.

infiltration - The flow or movement of water through the soil surface into the ground.

inflow - The flow of water into a surface or ground water source.

intermittent stream - A stream that flows only part of the time.

kettle - A depression in the ground surface formed by the melting of a block of ice buried or partially buried by glacial drift, either outwash or till.

knob - An isolated, prominent rounded hill or mountain.

Known Coal Leasing Area (KCLA) - A region, designated by the U.S. Geological Survey, as an area where coal of commercial quantities is known to exist.

lignite - A brownish-black coal in which the alteration of vegetal material has proceeded further than in peat but not so far as subbituminous coal.

limiting factor - A critical living or non-living element of an ecosystem necessary for an organism to survive that is in the least supply (i.e., the weakest "link in a chain").

loess - Material transported and deposited by wind and consisting predominently of silt sized particles.

long ton - 2,240 pounds (= a metric ton).

macro-invertebrate - Any invertebrate animal which can be viewed or observed without the aid of a microscope.

meander - A series of somewhat regular curves, bends or windings in the course of a stream.

megawatt - A million watts.

mesophyte - A plant that grows under intermediate moisture conditions.

mg/l - Milligrams per litre, the amount of chemicals present in a one litre of water expressed in milligrams which is one thousandth of a gram.

micro-invertebrate - An invertebrate animal so small as to require a microscope for easy viewing.

moraine - An accumulation of earth and stones carried and finally desposited by a glacier.

natural drainage classes -

excessively drained - usually sandy or gravelly soils; droughty
well drained - no water table within 40" of the surface
moderately well drained - water table within 20-40" of the surface
somewhat poorly drained - Water table within 10-20" of the surface
poorly drained - water table within 0-10" of the surface
very poorly drained - water standing on surface.

niche - The functional status of an organism in the ecosystem. An organism's "job".

orphan spoils - A spoils pile or waste dump not reclaimed or leveled.

overburden - Material of any nature, consolidated on unconsolidated, that overlies a deposit of useful materials, ores, or coal, especially those deposits that are mined from the surface by strip mining.

parent material - The unconsolidated and more or less chemically weathered mineral or organic matter from which the solum of soils is developed by pedogenic processes.

perennial stream - A stream that flows year around.

permeability - The soil or rocks capacity for transmitting a fluid (i.e., usually water).

pH - The relative acidity or alkalinity of the soil with pH 7.0 being neutral; greater than 7.0 increasingly alkaline; and less than 7.0 increasingly acid.

physiognomy - The surface character or features of the land, external aspect.

physiography - Physical geography; a description of the natural features of the surface of the earth.

piezometric surface - The surface to which the water from a given aquifer will rise under its full head.

piping - The movement of soil particles by percolating water leading to the development of channels.

plateau - An elevated piece of flat land with at least one side having an abrupt drop-off to lower land.

pollutant - Any agent or form that makes entrance into another material or organism and affects that material or organism in a deleterious fashion or creates a condition in the environment that's offensive to the aesthetic sense.

potentiometric gradient - Potential gradient means an ascending or descending value of voltage related to a linear measurement, as a distance along the earth surface or ground.

potholes - Shallow water holding depressions of glacial origin.

ppm - The amounts of chemicals present in a water sample measured in parts per million.

precipitation - The discharge of water from the atmosphere to the earth's surface in the form of rain, snow, hail, sleet, etc.

range site - A group of similar soils that produce similar types and amounts of native vegetation; i.e., silty range site.

relief - The elevations or inequalities of a land surface.

residual soil - A soil formed from or resting on consolidated rock of the same kind as that from which it was formed, and in the same location.

runoff - The part of precipitation appearing in surface streams.

scoria - Slaglike clinkers, burned and/or fused shale and fine grained sandstone; characteristic of burned out coal beds (local terminology; not true scoria).

sediment load - The solid material both organic and mineral that is suspended in water.

selective denial - An administrative process by which an action can be modified, in part, by denying the prescribed activity.

seral stage - The relatively transitory, intermediate communites prior to climax in the ecological process of succession.

sheet moraine - ground moraine - dead ice moraine - ablation till.

short ton - 2,000 pounds.

slumping - When the soil and earthy material on a steep slope become charged with water, their weight is greatly increased. At the same time the water makes them more mobile. Under these circumstances the material sometimes slides down the slopes, and when this occurs, it's referred to as "slumping".

sodium absorption ratio (SAR) - An index of the amount of sodium in a soil.

soil series - The basic unit of soil classification being a subdivision of a family and consisting of soils which are essentially alike in all major profile characteristics except the nature of the A horizon.

sola, solum - The A horizon plus the B horizon.

solubility - The amount of material that can be dissolved by water.

spring - A place where water from rocks or soil emerges upon the land or into a body of surface water.

stratigraphy - That part of the descriptive geology of an area or district which pertains to the discrimination, character, thickness, sequence, age, and correlation of the rocks of the district.

stripping ratio - The amount of spoil or overburden (cubic yards) that must be removed to gain access to a specific amount (tons) of ore or mineral material (coal).

succession - The progressive development of vegetation toward its highest ecological expression, the climax; the natural process of replacement of one plant community by another.

terraces - Step like form of land generally long and narrow with one side having a steep dropoff and the other having a steep rise.

texture - The relative proportions of sand, silt and clay in a soil, i.e., sandy loam.

topography - The configuration of a surface including its relief.

toxic overburden - Material of any nature, consolidated or unconsolidated, that overlies a deposit of useful materials, ores, or coal which has such chemical or physical properties as to make it unsuitable for plant growth. As used in this report, it is overburden that has a sodium adsorption ratio (SAR) of greater than 10 or an electrical conductivity (EC X 10^3) of greater than 7mmohs/cm. The EC is a measure of soluble salt content.

trophic level - Feeding level in the food chain. In complex natural communities, organisms whose food is obtained by the same number of steps are said to belong to the same trophic (feeding) level (i.e., producers, primary consumers, secondary consumers, etc.).

ug/l - Micrograms per litre, the amount of chemicals present in litre of water expressed in micrograms, which is one thousandth of a milligram.

underflow - The flow of water beneath a structure.

zooplankton - Minute floating animals found in aquatic habitats.

APPENDIX 6

APPENDIX 6

PUBLIC INVOLVEMENT

The draft environmental analysis record was prepared during the late spring and early summer of 1976. The draft document was printed in July, 1976, and distributed immediately following printing with an interest and comment solicitation letter (see accompanying letter) to 51 governmental agencies and potentially interested parties (see accompanying mailing list). Copies were also supplied to newspapers, TV stations, universities, and libraries in the Bismarck-Minot region, as well as the North Dakota State Clearing House. A comment period of approximately 30 days (through September 3, 1976) was allotted for public comment and response to the draft.

Comments and responses were received from eight entities for a response rate of approximately 16%. Since some of the solicitations were not of an individual nature, exact response rates are difficult to determine. All letters and comments received were first reviewed relative to either draft corrections or issues raised. Appropriate academic or technical corrections were then subsequently made into the final document.

The majority of comments and responses received came from other governmental agencies. Descriptive comments ranged from support of the draft document to negative declarations. Some responses were nondescript, or non-committal in nature, while others represented opinion assessments and philosophical viewpoints. Three fields of consistent concern were readily apparent from the responses. These fields were: 1) inaccuracies of some technical statements that need clarifying;

2) relative merits of reclamation or mitigation "success"; and 3) the need to expand on "selective denial" procedures. Generally, the draft document appeared to be relatively well received by those responding.

Copies of the correspondence received are included here-in along with notations indicating B.L.M. action taken in regard to the comments.

INTEREST AND COMMENT SOLICITATION NOTE

The Bureau of Land Management has received an application for the lease of approximately 120 acres of federal coal in Ward County, North Dakota. The Bureau has prepared a draft impact analysis dealing with the proposed lease. This draft will be available for comment during the month of August, 1976. The final analysis will be initiated at the end of that period.

Any comments you may have with regard to the analysis would be greatly appreciated. Your comments should be directed to, District Manager, Miles City District, Bureau of Land Management, P. O. Box 940, Miles City, Montana 59301, Attention: Environmental Coordinator. It is requested that your comments be sent so that they may be received no later than September 3, 1976.

CONSOL-VELVA COAL LEASE APPLICATION M-31969(ND)

MAILING LIST

KFYR - TV
Bismarck, North Dakota 58501

Ward County Commission
Minot, ND 58701

Minot Public Library
Minot, ND 58701

ND State Geological Survey
219 North 7th
Bismarck, ND 58501

ND State Legislative Council
Capitol Building
Bismarck, ND 58501

Mr. Norm Peterson
ND State Health Department
Capitol Building
Bismarck, ND 58501

Planning and Evaluation Staff
ND State Social Service Board
Highway 83 North
Bismarck, ND 58501

Secretary
ND State Public Service Commission
Capitol Building
Bismarck, ND 58501

Mr. Russ Staiger
ND State Planning Division
Capitol Building
Bismarck, ND 58501

Casper H. Wayman
U.S. Environmental Protection Agency,
Region VIII
1860 Lincoln Street
Denver, CO 80203

Gary Leppart
ND State Outdoor Recreation Agency
Fort Lincoln State Park
Mandan, ND 58554

U.S. Dept. of Agriculture
Soil Conservation Service -
Ward County - 108 Federal Building
Minot, ND 58701

KXMB - TV
Bismarck, ND 58501

U.S. Dept. of Agriculture
Forest Service - Custer National
Forest
ND Coordinator
Bismarck, ND 58501

U.S. Dept. of Agriculture
Soil Conservation Service -
State Office
3rd and Rosser Avenue
Bismarck, ND 58501

U.S. Dept. of Commerce
National Weather Service
Municipal Airport
Bismarck, ND 58501

U.S. Dept. of Interior
Bureau of Reclamation
504 E. Broadway
Bismarck, ND 58501

U.S. Dept. of Interior
Geological Survey
Water Resources Division
3rd and Rosser Avenue
Bismarck, ND 58501

U.S. Environmental Protection Agency
State Capitol
Bismarck, ND 58501

Mr. Gregg Larson
Lewis and Clark Resource Conservation
and Development Project
Mandan, ND 58554

Steve Schmidt
Bismarck Tribune
Bismarck, ND 58501

Bismarck Public Library
Bismarck, ND 58501

Bonnie Banks
ND State Clearing House
Bismarck, ND 58501

Mr. Jerry Groenewald
ND Geological Survey
University Station
Grand Forks, ND 58202

Ed Englerth
ND Public Service Commission
Capitol Building
Bismarck, ND 58501

Austin Engel
ND State Planning Division
Capitol Building
Bismarck, ND 58501

Richard Huschka
Consolidation Coal Company
P.O. Box 200
Stanton, ND 58571

Area Mining Supervisor
U.S. Geological Survey
P.O. Box 2550
Billings, MT 59103

Serria Club
c/o Rev. Arvin Roos
Steele, ND 58482

Mike Jacobs (The Onlooker)
308 6th Avenue Northwest
Mandan, ND 58554

Valorie Burlingame
U.S. Dept. of Defense
Corps of Engineers
Riverdale, ND 58565

Chief Engineer & Secretary
ND State Water Commission
Capitol Building
Bismarck, ND 58501

Commissioner
ND State Land Department
Capitol Building
Bismarck, ND 58501

Director
ND State Business & Industrial
Development Department
523 Bismarck Avenue
Bismarck, ND 58501

Director
ND State Economic Opportunity Office
Capitol Building
Bismarck, ND 58501

Executive Secretary
ND State Soil Conservation Committee
Capitol Building
Bismarck, ND 58501

Federal Energy Administration
3rd and Rosser Avenue
Bismarck, ND 58501

Mr. Nick Franke
ND State Historical Society
Liberty Memorial Building
Bismarck, ND 58501

Mr. Jim Gritman
U.S. Dept. of Interior
Fish and Wildlife Service
1500 Capitol Avenue
P.O. Box 1897
Bismarck, ND 58501

Mrs. Betty Morgan
North Dakota Wildlife Federation
200 West Main
P. O. Box 1694
Bismarck, ND 58501

Dr. Bill Johnson
ND Regional Environmental Assessment
Program
Capitol Building
Bismarck, ND 58501

Dr. Paul Kannowski
Institute for Ecological Studies
University of North Dakota
Grand Forks, ND 58201

Dr. Larry Loendorf
University of North Dakota
Grand Forks, ND 58201

Mayor's Office
City of Velva
Velva, ND 58790

Ward County Assessor's Office
Minot, ND 58701

Missouri River Basin Commission
601 Bismarck Avenue
Bismarck, ND 58501

Mr. Bob Morgan
ND State Game & Fish Department
2121 Lovett Avenue
Bismarck, ND 58501

ND State Coal Development Impact
Office
Capitol Building
Bismarck, ND 58501

Ward County Commissioners
Minot, ND 58701

U.S. Dept. of Agriculture
Soil Conservation Service -
Ward County
408 20th Avenue SW
Minot, ND 58701

LETTER #1

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Box 1458, Bismarck, North Dakota 58501

August 24, 1976

District Manager
Miles City District
Bureau of Land Management
P.O. Box 940
Miles City, Montana 59301

Miles City District
DM
AUG 26 1976
NRS
ROBERTS DAR

ATTENTION: Environmental Coordinator

Dear Sir:

With reference to your draft environmental analysis of the Velva Coal Lease Application for approximately 120 acres of federal coal land in Ward County, North Dakota, we have the following comments:

1-1 1. Page 2-30, first para., last sentence. Suggest reference to the State listing of any endangered or threatened species.

1-2 2. Page 3-6, 4th para. If water is to be removed from the mine pits, attempts should be made to minimize the pumping of sediments which would degrade habitat in Bowers Coulee.

1-3 3. Page 3-15, 1st para. Creating wetland basins should be considered particularly if this feature existed on the tract prior to excavation, or deemed advisable to meet state resource goals.

We appreciated the opportunity to review the draft environmental analysis.

Sincerely,

Allen L. Fisk

Allen L. Fisk
State Conservationist

cc: R. M. Davis, Administrator, SCS, Washington, D.C.
Coordinator of Environmental Activities, USDA, Washington, D.C.

BLM Action - U. S. Soil Conservation Service Letter #1

Key No.

1-1 This statement is correct as written in the draft E.A.R.. No change was made in the document.

1-2 This point is covered in item #4 of the mitigating measures, page 4-2 of the document. No change was made in the E.A.R. narrative.

1-3 The analysis team agrees. See items 27 and 28 of possible mitigating measures (pages 4-8 and 4-9).

LETTER #2

NORTH DAKOTA STATE PLANNING DIVISION

STATE CAPITOL—FOURTH FLOOR—BISMARCK, NORTH DAKOTA 58505
701 224-2818

Miles City District
DM.................Asst. DM ...RB.......
RPM.................Opr.................

SEP 1 1976

Adm...........RGD..........Pwdr..........
Pr...........SD...........NDPO..........
Action........................File..........

ROBERTS
[illegible]

August 31, 1976

STATE INTERGOVERNMENTAL CLEARINGHOUSE "LETTER OF COMMENT"
ON PROJECT REVIEW IN CONFORMANCE WITH OMB CIRCULAR NO. A-95

To: Bureau of Land Management

STATE APPLICATION IDENTIFIER: 7607302499

Mr. Bob Bennett, Environmental Coordinator
U.S. Department of the Interior
Bureau of Land Management
P.O. Box 940
Miles City, Montana 59301

Dear Mr. Bennett:

Subject: Draft Environmental Analysis Record by the Bureau of Land Management for the Velva Mine Coal Lease.

This draft environmental analysis was received in our office on July 30, 1976.

In the process of the A-95 review, the attached comments were received from the Governor's Office, Water Commission, Game and Fish Department, and the Public Service Commission.

2-1 This document and attachments constitute the comment of the State Intergovernmental Clearinghouse, made in compliance with OMB Circular No. A-95.

Sincerely yours,

Bonnie A. Banks
Mrs. Leonard E. Banks
Associate Planner

LEB/ds

Attachments

BLM Action - North Dakota State Planning Division
Intergovernmental Clearing House Letter #2

Key No.	
2-1	No response necessary. No comment received from North Dakota State Water Commission.

LETTER #3

August 5, 1976

TO: State Intergovernmental Clearinghouse
State Planning Division
State Capitol
Bismarck, North Dakota 58505

FROM: Dwight Connor
Governor's Office

The environmental impacts of not leasing the 120 acres of federal coal next to Consolidation Coal Company's Velva Mine is essentially the same as leasing the coal.

3-1 In order to maintain a logical and unitized mining operation, the acreage should be leased. It should be stipulated in the lease that the lessee will be required to comply with all state laws and regulations concerning coal mining; EAR #21, Page 1-14.

BLM Action - North Dakota Governor's Office Letter #3

Key No.

3-1 No response necessary.

LETTER #4

COMMISSIONERS
RICHARD A. ELKIN, PRESIDENT • BRUCE HAGEN • BEN J. WOLF

AL BUMANN
SECRETARY

PUBLIC
SERVICE
COMMISSION

PSC

STATE OF NORTH DAKOTA

BISMARCK 58505

Miles City District
DM ... Asst. DM 1 KB
RFM ... Opr. KH

JUL 30 1976

Adm. ... EGO ... Pwdr
Pr. ... NEPO copy sent
Action 2 ... File

EAR

July 27, 1976

District Manager
Miles City District
Bureau of Land Management
P.O. Box 940
Miles City, MT 59301

Attention: Environmental Coordinator

RE: Velva Coal Lease Application M-31969(ND)
Environmental Analysis Record
(June 1976)
Activity 1212

Dear Sir:

At this time, the North Dakota Public Service Commission has only two comments on the draft EAR.

4-1 Chapter 1, page 7, line 8: The information given regarding the requirements of North Dakota law is not entirely accurate. At the end of the initial three-year reclamation period, the State must give the mining company two one-year reclamation extensions upon request; further extensions, again on a year-to-year basis, may be made at the discretion of the State.

4-2 Chapter 3, page 8, paragraph 1: The paragraph is not accurate in that the water pumped from the pits is not allowed to evaporate from sediment ponds, and therefore does find its way into the natural drainage system.

Yours truly,

Edward J. Englerth

Dr. Edward J. Englerth
Director
Reclamation and Siting Division

md

BLM Action - North Dakota State Public Service
Commission Letter #4

Key No.

4-1 The E.A.R. narrative was amended to reflect the proper regulatory procedure.

4-2 The narrative was changed to clarify the present water handling process at the Velva Mine.

STATE OF NORTH DAKOTA
OFFICE OF

State Land Department

R. E. LOMMEN COMMISSIONER 224-2801

LAVINA WEGNER	SECRETARY & INFOR.	224-2800
MARGARET PEDERSON	LAND SALES	224-2802
EMMA PEIGHTAL	TITLE CLERK	224-2802
OTTO BERVIK	DEP. & LEASING MGR.	224-2803
THERESIA FISCHER	LOAN MGR.	224-2804
JOYCE MALMSTAD	ACCOUNTANT	224-2805
MARVIN THOMPSON	COLLECTION MGR.	224-2806
THOMAS O. SMITH	DEPT. ATTORNEY	224-2807

UNIVERSITY AND SCHOOL LANDS SIXTH FLOOR STATE CAPITOL BISMARCK, NORTH DAKOTA 58501

LETTER #5

July 29, 1976

Miles City District
DM ... Asst. DM
RPM ... Ops
AUG 2 1976
Adm ... BGO ... Prod
Pr ... SO ... NDO copy sent
Action ... File
Bennett
Roberts

District Manager, Miles City District
Bureau of Land Management
P. O. Box 940
Miles City, Montana 59301

ATTN: Environmental Coordinator

Dear Sir:

We have reviewed the draft environment analysis of the Velva Coal lease of June, 1976. We have no objections to proceding with the lease.

5-1 There are some suggestions on technical statements. The stockpiling of topsoil operation usually decreases the value of the topsoil by about 25 percent because the transporting machinery traveling over the stockpile acts as a packer. This is also true to a lesser extent to the stockpiled subsoils. You may wish to alter the statement on pages 3 - 5.

5-2 On page 3 - 9, we suggest stockpiling the gravel under the wabek soils for sale as road surfacing gravel. It is a resource that should not be wasted by mixing to other soil material or spoil material.

Sincerely,

Lloyd Shoesmith

Lloyd Shoesmith
Land Analyst

LS/ae

BLM Action - North Dakota State Land Department Letter #5

Key No.

5-1 The narrative on page 3-5 was corrected and modified to reflect the relevant situation. There could be either an increase, or decrease, in porosity and permeability of the topsoil.

5-2 A good point. The E.A.R. narrative was modified to reflect this additional resource usage.

LETTER #6

North Dakota State

Environmental Control

DIVISION OF WATER SUPPLY
AND POLLUTION CONTROL

NORMAN L. PETERSON, P.E.
DIRECTOR

(701) 224-2386

W. VAN HEUVELEN, CHIEF

Department of Health
State Capitol
Bismarck, North Dakota 58505

August 31, 1976

District Manager
Miles City District
Bureau of Land Management
P.O. Box 940
Miles City, Montana 59301

ATTENTION: Environmental Coordinator

Dear District Manager:

This Department has reviewed your Draft Impact Analysis dealing with the proposed coal lease at the Velva mine.

The areas of concern at the present time are:

6-1 1. Submittal of permit application if any new water discharge points are created by the additional mining.

6-2 2. Notification of our Department if any change in characteristics of water discharge composition are created.

Sincerely yours,

Dennis Fewless

Dennis R. Fewless
Sanitarian

DRF/tjg

BLM Action - North Dakota State Department of Health Letter #6

Key No.

6-1 and 6-2	Any mining application with the BLM involves only the lease of federal coal. The applicant is still obligated to comply with all state laws and requirements, independent of the federal coal lease application (see item #21, page 1-14).

LETTER #7

Miles City District
DM RB
RPM /
AUG 18 1976
Adm BGD Pwdr
Pr SD NDPO
Action File ROBERTS [illegible]

IN HUNTING & FISHING
VARIETY

NORTH DAKOTA GAME AND FISH DEPARTMENT

August 16, 1976

District Manager
Miles City District
Bureau of Land Management
P.O. Box 940
Miles City, MT 59301

ATTENTION: Environmental Coordinator

Dear Sir:

Enclosed are the North Dakota Game & Fish Department's comments on the Draft EAR for the Velva Mine Coal Lease.

We appreciate the opportunity to review and comment on this proposed lease.

Sincerely,

Robert L. Morgan

Robert L. Morgan - Chief
Lands & Development Division
North Dakota Game & Fish Department

RLM:hk
Enclosure

RUSSELL W. STUART
COMMISSIONER

WILBUR BOLDT
DEPUTY COMMISSIONER

H. H. SPITZER
CHIEF, ENFORCEMENT DIVISION

DALE HENEGAR
CHIEF, FISHERIES DIVISION

C. R. GRONDAHL
LEADER, GAME INVESTIGATIONS

R. L. MORGAN
LEADER, HABITAT DEVELOPMENT

PERSHING CARLSON
CHIEF, PUBLIC RELATIONS DIVISION

COMMENTS BY THE NORTH DAKOTA GAME AND FISH DEPARTMENT

ON BLM'S DRAFT ENVIRONMENTAL ANALYSIS RECORD OF THE VELVA MINE COAL LEASE

August 11, 1976

7-1

1-7 In our opinion, no lease should be issued until "someone" pays the U.S. Government for the 50-55 acres of coal (roughly 1.25 million tons of coal) that was removed in the past, or until it is proven that Consolidated Coal Company is in no way responsible for the removal or payment for said coal removed.

7-2

2-6 (para. 1) "These numerous water bodies are generally saline and of poor quality."

To what water bodies does this statement apply? Poor quality for what - duck production, furbearer production, drinking water, irrigation, etc.?

"Potholes, small lakes and sloughs" in this region lie within the "immensely productive prairie pothole biotic region, which is well known for its vast waterfowl breeding grounds". (2-28, lines 14-16).

This statement should be clarified.

7-3

2-23 Trees are not mentioned in the vegetation section. A 1961 aerial photo we have of the site indicates that scattered tall trees exist on the grassland portion of this 120 acre tract.

7-4

2-25 "No natural wetlands occur directly on the surface lands overlying the subject Federal coal." Does this mean there are no wetlands on the entire 120 acre tract (excepting ponds in 55 A mined area) or that no natural wetlands lie in the area to be mined? There appears to be several small basins in the native grassland portion of this 120 acre tract. Please clarify.

7-5 2-33 In general, we fully support the statement that "The shrub complex found on this tract, while not truly "fragile", does represent a marginal plant community that is highly dependent on the micro-climate conditions of the specific site. For this reason, the shrub complex could be considered environmentally sensitive".

7-6 3-5 "The stockpiled topsoil could experience an increase in porosity and permeability due to the break-up and mixing of the material."

According to some reports we have read, topsoil may be compacted quite a bit by placing in the stockpile and running over same with heavy equipment to dump more topsoil. Please clarify.

7-7 3-13 & 3-14 We generally support the statements pertaining to grass and forbs, shrubs and broadleaf trees. We question, however, whether a "beneficial" impact would occur by planting shrubs and caring for same until established. We could accept that a "decreased" or a "lessened" impact would occur from planting and establishing shrubs to replace native shrubs destroyed, but the overall impact would still be adverse rather than beneficial. In our opinion, it is highly unlikely that an artificial planting of shrubs will ever compensate for a native stand of shrubs.

7-8 The situation might be improved by using a tree spade to move native clumps of chokecherrys, buffaloberry, etc., to another prepared mining site. This technique could also be considered for moving clumps of native prairie "seed" patches to another site to be reclaimed to native prairie.

7-9 4-5 (4) "Undulating terrain could be developed during the regrading process. This would help provide some of the necessary ecological requirements of the endemic wildlife species."

This brings up the question of what will happen to the "50-55 acres" of "mined land" on this 120 acre tract. Will it be reclaimed, some left, or what? Please clarify.

7-10 4-7 (18) We agree.

7-11 4-9 (28) Assume "natural" drainage-way means reconstructed drainage-way or reshaped or reclaimed drainage-way. If it does, we agree.

7-12 4-11 & 12 (38) "Proper reclamation should leave the land as economically productive as before mining."

We would like to see data to support this "gutty" statement. Best productivity claimed by a mining company to date in writing is approximately 85 percent for the Falkirk Mine.

7-13 "Successful reclamation will also promote positive public sentiment toward the mining effort." We would remind BLM personnel that more is at stake in the "mining effort" than just reclamation of the mined site. North Dakota citizens are rightfully concerned about air and water pollution, public tax costs, population increases and the related problems, transmission lines or pipelines, etc. This statement seems out-of-place in an Environmental Analysis.

7-14 4-12 (39) "Although possibly not a true "mitigating" measure, but rather a lease alternative, the regulatory authority of the BLM leasing officials to selectively deny unsuitable lease tracts (i.e. the on-site existence of critical or sensitive vegetative components, or excessively steep slopes, etc.), functions as a defacto mitigating measure."

7-14 This is a key statement in this report, but it needs to be expanded. BLM officials must not only consider selective leasing or denial on an individual tract basis, but they must also consider selective leasing or denial for a portion or portions of a tract. Only by this method, can energy and environmental considerations be adequately addressed.

7-15 We have, in recent months, looked at and reviewed three Environmental Analysis Records by BLM regarding coal leasing in North Dakota. All three contain the same lease all or lease none approach to a rather complex problem, namely, providing energy with minimal environmental damage. These reports will never be a true environmental analysis until "selective leasing" for tracts or for specific acreage within tracts is considered as a viable alternative to the Proposed Action.

The only Alternative considered to date in the three reports, the NO ACTION alternative, has been nothing more than an obvious economic justification for total leasing. The Proposed Action itself has, to date, been a general justification for leasing with emphasis on mitigation. Thus, the purpose of an Environmental Analysis - to ascertain specific adverse environmental hazards within these tract units to guide leasing of said tracts - has, in our opinion, been largely ignored in these past three Environmental Analysis Records.

Therefore, we strongly urge that "selective leasing" be considered a viable alternative to the proposed action, and as such be added to future BLM Environmental Analysis Records.

7-15 For if, "selective leasing or denial" is not thoroughly discussed in future Environmental Analysis Records, this Department will have little choice but to strongly object to any proposed action that fails to discuss the protection of certain critical areas within these tracts. We would also have little choice except to request that an Environmental Impact Statement be prepared for the said lease proposal.

7-16 5-3 VEGETATION - "Unless shrubs and broadleaf trees are also replaced, an adverse residual impact on these environmental subcomponents would be realized. The same rationale and circumstance pertains to aquatic (wetland) vegetation complexes."

We appreciate the fact that broadleaf trees and wetlands are finally mentioned in this EAR. We completely support this statement. Native grasslands, woody habitat and wetlands should either be compensated for in the reclamation planning and development effort, or preserved. Native grasslands should be restored by seeding like acreages to native grass seed mixtures and transplanting "seed patches" using a tree spade. Native woodland habitat should be replaced on a two for 1 basis by planting or by transplanting (tree spade). Compensation for wetlands should be worked out with the Fish and Wildlife Service (state office).

7-17 6-4 RECREATION - "The short term use of the area for mining would not affect long term recreation productivity if successfully reclaimed."

7-17 If the mined area were successfully relaimed in kind or with more diversity. We would, however, have to agree with the last sentence under ANIMALS on the preceding page - "with the present reclamation emphasis, however, it is unlikely that pre-mining wildlife productivity would be achieved".

Since the EAR has stated that "The major recreation use potential of the lands involved is hunting upland game and deer" (page 2-37), we cannot agree that "mining would not affect (the) long term recreation productivity".

7-4 RECREATION - Same comment as applied to 6-4 RECREATION.

7-18 7-4 LAND USE - "Proper reclamation should return the land to a condition equal to or better than its pre-mining operation."

Please explain how it will be better, and from who's standpoint or what standpoint. How about from the wildlife standpoint?

7-19 8-1 ALTERNATIVES TO THE PROPOSED ACTION

NO ACTION

We heartily disagree with the statement that "The only real alternative to the applicant's coal lease request is to deny the lease application".

We firmly believe that a viable alternative is to approve a portion of the acreage in the lease application and deny a portion of the acreage in the lease application (Selective Leasing). To either accept the whole acreage or deny the whole acreage applied for by the lease application seems to defeat the purpose of making an Environmental Analysis Record. A tract may be 640 acres, but contain only 60 acres considered to be critical or sensitive vegetative components.

7-19 To lease the entire 640 acre tract would cause unnecessary environmental damage. To deny the entire 640 tract to save the 60 acres would cause unnecessary problems as regards energy needs, etc. There has to be an alternative that considers both energy and environmental needs.

Other than the above comment, we will only say that the NO ACTION section is an economic justification for the proposed action section. As such, we find it completely unsatisfactory.

7-20 A 2-13 We would appreciate having the capability class shown in the top table - could follow Map Symbol. Would save us from checking back and forth from data given on next page.

7-21 General Comments It would be most helpful to people reviewing these Environmental Analysis Records, if pertinent data relating to the lease tract (s) could be found in one place at the front of the report. Pertinent data includes a tract map, soils map, capability map, land use map and table, woody acreage, watershed or drainage maps, topography map, etc. While most of this information is presented in the analysis, one must pick it out of scattered parts of the report - including the appendix.

7-22 It would also be very helpful if a map indicating extent of proposed mining or spoiling on tract were included. We realize this EAR contains a map showing three years (1977, 1978 1979) of mining, but the narrative indicates federal coal under tract "would be enough to operate the mine for four years".

7-23 We believe the EAR should address itself more to information regarding the specific tract(s), and less to "general" regional information.

BLM Action - North Dakota State Game and Fish Department Letter #7

Key No.

7-1 The coal trespass is being investigated and will be handled as a separate legal entity from the environmental analysis record and subject coal lease application (see page 1-7). The narrative was modified to clarify this point.

7-2 These statements appeared on pages 2-16 and 2-28 of the draft document. The narrative on page 2-16 was expanded to clarify the water quality reference.

7-3 Trees do occur on the subject lease tract. The E.A.R. narrative on page 2-23 was revised to indicate the occurrence of scattered green ash and aspen trees.

7-4 A field exam of the proposed lease tract by BLM personnel in April, 1976, did not reveal the occurrence of any natural wetlands in the 120 acre proposed lease tract. The narrative was modified to indicate the areal extent of the statement (see page 2-25).

7-5 No response necessary.

7-6 The E.A.R. narrative was modified to reflect this situation (see page 3-5 of the final document).

7-7 Impacts rated in Chapter 3 of the analysis are directional in nature, and therefore, planting shrubs is a beneficial impact on a mined area. The narrative of the analysis was expanded to clarify this point (see page 3-1). The analysis team agrees that ". . . it is highly unlikely that an artificial planting of shrubs will ever compensate for a native stand of shrubs . . .", and this point is graphically explained in Appendix 3, pages A3-6 and A3-7 (residual difference).

7-8 This suggested planting technique was incorporated in the mitigating measures section (see item #30, page 4-9, Chapter 4).

7-9 The reclamation status of the "mined-out" area is intimately tied to the minerals trespass investigation (see page 1-7), which will determine the final disposition of the mined out area. It is not within the scope of this environmental analysis to address that outcome.

7-10 No response necessary.

Key No.

7-11 The analysis narrative was expanded to clarify this point (see item #28, page 4-9).

7-12 This statement was conjectural in the draft document. The statement has been modified in the final analysis to clarify the situation.

7-13 The attitudes and expectations of the public are legitimate concerns of an environmental analysis, and as such, this seems to be appropriate in this document.

7-14 This statement was corrected in the document narrative to indicate that portions of proposed lease tracts may be deleted by administrative option of the BLM land manager (see page 4-12).

7-15 The definitive action analyzed by the BLM on a minerals lease application (i.e., coal) is to lease, or not lease. The BLM does have the option of selectively denying the lease of certain tracts, or portions thereof, of a lease application for documented reasons such as excessive environmental degradation.

The analysis narrative was expanded to clarify this (see page 8-1).

7-16 No response necessary.

7-17 To the best of our knowledge, no recreational use data (i.e., hunter man days, etc.) is specifically available for the proposed lease tract. Without specific use data, recreation productivity is purely speculative. This point is a matter of judgment, and you may very well be right. No change was made in the EAR document.

7-18 The analysis narrative was corrected to reflect the realistic relationship of the land use commitment (see page 7-4).

7-19 Philosophical viewpoint. The relationship of the administrative option of selective denial to the "no action" alternative of this analysis is explained on page 8-1 of the document.

7-20 The analysis team believes the soils tables in Appendix 2 were properly assembled by subject and function; therefore, no change was made in the document.

Key No.

7-21 Convenience in organizing information and reviewing any report is a matter of personal preference and needs. This preference and need varies from person to person. The BLM uses a standard format for environmental analysis. This standard format dictates that the text of the document be concise and to the point, and that supportive type information be attached as an appendix. The team feels that this document complies with those requirements.

7-22 The document narrative was corrected to clarify this ambiguity (see page 1-7).

7-23 The resource specialists on the analysis team attempted to assemble and evaluate the best available (most recent, or most appropriate) information in developing this environmental analysis. If this analysis seems remiss in some respects, or of too general nature, it may be due to a lack of readily available information (i.e., site specific hunter harvest statistics, endangered species inventory, etc.).

LETTER #8

CONSOL

Consolidation Coal Company
Western Division
GLENHAROLD MINE
Stanton, North Dakota 58571

August 31, 1976

Miles City District
DM ____ Asst. DM ____
RPM ____ Opr. ____
SEP 2 1976
Adm ____ [illegible] ____
Pr ____ SO ____ [illegible] ____
Action ____ [illegible] ____
ROBERTS -DAR

District Manager
Miles City District
Bureau of Land Management
P.O. Box 940
Miles City, Montana 59301

Attention: Environmental Coordinator

Referenced is the Draft Environmental Analysis Record for Consolidation Coal Companies Glenharold and Velva Mines.

Following are our comments regarding these reports:

GLENHAROLD MINE

Page

(i) Change 2,000 acres to 1,920 acres.

(ii) We suggest dropping the word impossible in the sentence, "These areas may prove difficult or impossible to reclaim.", or adding "back to the original land use".

(1-4) Number 3. Consolidation Coal Company has invested 14 million dollars for equipment and surface facilities at the project.

(1-5) Change 1,922.44 acres to 1,920 acres.

(1-13) Number 1. There is no definition of toxic overburden in the glossary.

(1-17) Change 1,922.44 acres to 1,920 acres.

GLENHAROLD (continued)

(2-18) At the present time we have no ground water at the Glenharold Mine. The water which is pumped into the settling ponds is from surface run off and at times we do discharge from these ponds.

(2-45) Hunting of upland game and deer does occur on reclaimed lands as well as adjacent land during the fall hunting seasons.

(2-46) Population The expansion of the Glenharold Mine has affected Washburn, McClean County and Center, Oliver County as well as Stanton, Mercer County.

(2-53) Location is N½N½, Section 32, T. 144N, R. 84W, 5th P.M.

(3-5) With the equipment presently at the Glenharold Mine we have a maximum depth limit of 110 feet.

(3-6) Neither the overburden nor the coal act as an aquifer at the Glenharold Mine. We have not in the past nor do we expect to intercept ground water saturation.

(3-7) See 3-9.

(3-9) Paragraph 3. Bower's Coulee is at the Velva Mine. There is no continuous pumping at the Glenharold Mine, and all water is pumped into settling ponds prior to discharge. There is no groundwater within the depth we are mining, therefore, the overburden will not come into contact with the groundwater.

(3-13) Removal and replacement of the topsoil and subsoil is at the depths suggested by the North Dakota Public Service Commission Inspectors. Great care is taken to assure there is a minimum of mixing of the topsoil and subsoil.

(3-16) The emphasis on reclamation is toward native grasses, not introduced grasses.

GLENHAROLD (continued)

(3-24) Hunting opportunities may be disrupted during the mining of the 480 acres. However hunting should not be lost for the entire tract at the same time. Hunting of upland game is generally very good after the land has been reclaimed and grasses have been planted.

(4-2) Toxic material has no definition. Also the depth has been changed from 5 feet on page (1-13) to 8 feet.

(5-2) We do not blast the overburden at the Glenharold Mine.

(7-2) There are no local aquifers within the present mining areas.

(9-1) Consolidation Coal rather than Consolidated Coal.

(A5-13) Stripping Ratio - The amount of spoil or overburden in yards that must be removed to gain access to a ton or tons of coal.

VELVA MINE

Page

8-1 (1-11) Toxic overburden (not defined).

8-2 (2-37) Hunting of upland game and deer has not been eliminated at the mine or on the adjacent land. The fall hunting season is generally good especially for deer.

8-3 (3-10) The removal and replacement of topsoil materials is done under the supervision of the Public Service Commission, and great care is taken to minimize the amount of subsoil mixed with the topsoil.

VELVA (continued)

8-4 (4-2) Number 6 - Toxic material definition and the change in depth requirement from 1-11.

8-5 (9-1) Consolidation Coal Company not Consolidated Coal Company.

8-6 (A5-13) Stripping Ratio - The amount of spoil or overburden in yards that must be removed to gain access to a ton or tons of coal.

If you have any questions regarding these comments, please feel free to contact me.

Sincerely,

Richard A Huschka

Richard A. Huschka
Environmental Engineer

RAH/lm

cc: B. Beach
S. Borell
M. Clark
L. Fuller
S. Rothman
D. Ryder
M. Thurman
R. Zeigler

BLM Action - Consolidation Coal Company Letter #8

Key No.

8-1 A definition for toxic overburden was inserted in the glossary (see Appendix 5).

8-2 The E.A.R. narrative was corrected to reflect this recreational use (see page 2-37).

8-3 Company viewpoint. The analysis team feels there is no practical way to completely eliminate the mixing of "topsoils" and "subsoil". A slight change was made in the analysis narrative (see page 3-10).

8-4 This statement in the document narrative was corrected to reflect the proper depth. The definition of toxic material is the same as for toxic overburden in the glossary (see page 4-2 and A5-14).

8-5 Text was corrected (see page 9-1).

8-6 The stripping ratio definition was clarified to reflect the terminology commonly used in coal strip mining operations (see Appendix page A5-13).

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